REPORT RESUMES

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REORGANIZED SCIENCE CURRICULUM, 8, GRADE EIGHT SUPPLEMENT.
MINNEAPOLIS SPECIAL SCHOOL DISTRICT NO. 1, MINN.

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DESCRIPTORS- *BIBLIOGRAPHIES, *CURRICULUM DEVELOPMENT, *CURRICULUM, *EARTH SCIENCE, *GRADE 8, METEOROLOGY, SECONDARY SCHOOL SCIENCE, TEACHING GUIDES, ASTRONOMY, GEOLOGY, INSTRUCTIONAL MATERIALS, PHYSICAL SCIENCES, SCIENCE EQUIPMENT, SCIENCE ACTIVITIES, SCIENCE MATERIALS, MINNEAPOLIS, MINNESOTA,

THE FOURTEENTH IN A SERIES OF 17 VOLUMES, THIS VOLUME PROVIDES THE EIGHTH GRADE TEACHER WITH A GUIDE TO THE REORGANIZED SCIENCE CURRICULUM OF THE MINNEAPOLIS PUBLIC SCHOOLS. THE MATERIALS ARE AUGMENTED AND REVISED AS THE NEED ARISES. A CHART INDICATES CONCEPT BRIEF SUMMARY OF SUBJECT MATTER CONTENT FOR GRADE 8, AND A CHART OF THE GRADE CONTENT FOR THE ENTIRE K-12 PROGRAM IN EACH OF THE FOLLOWING MAJOR AREAS AROUND WHICH THE PROGRAM IS DESIGNED--(1) THE EARTH, (2) LIVING THINGS, (3) ENERGY, AND (4) THE UNIVERSE. THIS VOLUME ALSO CONTAINS THESE SECTIONS--(1) CONCEPTS, (2) LEARNING EXPERIENCES, (3) BIBLIOGRAPHY, BOOKS, (4) BIBLIOGRAPHY, FILMS, (5) BIBLIOGRAPHY, FILMSTRIPS, AND (6) EQUIPMENT AND SUPPLIES. THE LEARNING EXPERIENCES SECTION IS CONCERNED WITH WEATHER INSTRUMENTS, MINERAL IDENTIFICATION, AND THE SOLAR SYSTEM. (DH)

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SCIENTIFIC APPROACH TO PROBLEM SOLVING

1. Observation--first-hand experiences and observation.

2. Definition of PROBLEM--ask questions, choose one for investigation.

3. Results of other investigators--read about problem, discuss it with interested friends and resource people, examine the written material.

4. Possible solutions--list all possible guesses.

5. Choosing the best solution (HYPOTHESIS)--pick the "best guess".

6. Testing the hypothesis--planning and carrying out EXPERIMENTS to determine its truth.

7. CONCLUSION of accepting or rejecting hypothesis--draw conclusion from experiments to determine acceptance or rejection of "best guess".

8. More extensive testing of hypothesis--experiment further to determine if hypothesis always holds true.

9. Stating the THEORY and publishing results--restate the hypothesis in light of the above experimentation, publish in professional journal.

10. Finding mathematical proof--do any measuring and mathematical calculations to develop proof of theory.

11. Statement of LAW or PRINCIPLE--if no one can find a mistake in the mathematical proof or develop a contrary proof, the theory becomes a law or principle.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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THE GRADE EIGHT SUPPLEMENT

to the

REORANGIZED SCIENCE CURRICULUM

Kindergarten Through Grade Twelve

(For Discussion Purposes Only)

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MINNEAPOLIS PUBLIC SCHOOLS
special school district no. 1
Minneapolis, Minnesota

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October 21, 1966

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FOREWORD

Long before that famous October fourth, 1957, when Sputnik I rocketed into orbit, the science teachers of the Minneapolis Public Schools eagerly began work on the reorganization of the science curriculum from kindergarten through grade twelve. This reorganized science curriculum was requested by our instructional staff and developed by representative members of that staff.

The citizen of today must be science literate in order to exercise adequately his duties of citizenship. The contribution of the scientist to our way of life is the methods which he uses to attack a problem and seek its solution. These methods are unique, but more important, they are very useful; they can be applied in the solution of the everyday problem by knowledgeable children at all ages and grade levels, and by adults in all walks of life. If these methods of science are to be learned by the youth of Minneapolis, they must be learned by attacking realistic problems inside and outside the classroom. This practice in the solving of work-a-day problems trains our young citizens to think for themselves in seeking new solutions to age-old problems of our civilization.

In the Minneapolis Public Schools we recognize that science is a very important part of the liberal arts general education which should be studied by all students. We are aware of our responsibility for instruction which must be well grounded in the fundamental laws and principles in all the fields of the basic sciences and therefore propose this reorganized curriculum for teaching the ever-expanding knowledge of science.

This reorganized science curriculum does not teach itself. It is a planned developmental approach in which the teacher is the expeditor and not the limiter of learning. The curriculum has been developed to aid the student in acquiring new breadths and new depths of understanding of his environment; and with it a teacher who is well trained in science may lead the student in an ever-expanding investigation of his surroundings in this world and universe. If the curriculum is used cooperatively by teacher and students, it is an instrument which can mold a pupil of the Minneapolis Public Schools into a science-literate citizen who, if he continues advanced science training, may become a scientist of the future.

Rufus A. Putnam
Superintendent of Schools

INTRODUCTION

This Supplement has been prepared as a convenient reference to assist the eighth grade general science teacher to produce an effective program of instruction with his pupils. General science teachers suggested the content and assisted with the preparation of each section of this Supplement. Those who helped prepare this material laid no claim to its "perfection". However, its value to each and every eighth grade science teacher can only be determined by its use and subsequent constructive suggestions made for its improvement. All Minneapolis Public Schools personnel are invited to cooperate in the updating and improvement of this Supplement as a usable academic tool for the beginning and experienced classroom science teacher.

This Supplement is not complete at the present time. When additional useful materials are developed, a copy will be furnished to you to place in these loose-leaf binders. Your cooperation with us to keep your Supplement up-to-date will be appreciated. When you leave our Minneapolis Public Schools, please leave your Supplement in your room for the next teacher's use.

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

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SUMMARY OF GRADE-CONTENT ASSIGNMENTS

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
Introduction to Science (Gray)	*	*	*	+	*	*	*	+	+	+	+	+	+
A. Attitudes (Including history)	+	+	+	+	+	+	+	+		+			+
B. Tools	+		+	+	+		+		*				+
C. Methods	+		+	*	+	+	+			*			
I. The Earth (Red)	+	+	+	*	*	+		+	*				
A. History of the earth					+				+				
B. Physical features	*	+		+	+				+				
C. Rocks and minerals	+	*			+				+				
D. Soils		+		+	+				+				
E. Water	*		*	+	*			*					
F. Air	+	*		+	*			*					
G. Weather and climate				+		*			*				

Key to symbols -- * major emphasis
+ content to be taught

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Area and Major Topics	Grade Level K	1	2	3	4	5	6	7	8	9	10	11	12
II. Living Things (Green)	+	+	+	+	+	+		*			*		
A. Life and life processes	+	+	+	+		*		+			+		
1. Life in general	+			*		+		+			+		
2. Food taking or nutrition		*	*	+		+		+			+		
3. Digestion								+			+		
4. Absorption						+		+			+		
5. Circulation				+		+		+			+		
6. Respiration						+		+			+		
7. Assimilation								+			+		
8. Oxidation						+		+			+		
9. Excretion				+		+		+			+		
10. Reproduction and growth		*	*	*		+		+			+		
11. Responsiveness	+	*	+	+		+		+			+		
B. Classification	*	+	+	+		*		+			+		
C. Ecology	*	+	*	*	*			+			+		
D. Plant and animal economics	+	+	+	*	*			+			+		
E. Human body	*	*	*	*		*		*			+		
F. Aesthetic values	*			*				+			+		

(continued)

Grade-content assignments (continued)

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
III. Energy (Yellow)	+	+	+	+	+	+	+			+		*	+
A. Properties of matter related to energy	+			*			*			*		+	*
B. Sources and conservation of energy	+			+		*				+		+	+
C. Mechanical energy and simple machines	*		*	*			*			*		+	
D. Gravitational energy	+			+			+			+		+	
E. Magnetic energy	*		*	+	*					+		+	
F. Sound		*	*				*			+		+	
G. Electrical energy		*		*		*				*		*	
1. Static						+				+		+	
2. Current		*		*		+				*		+	
H. Communication bands and electronics												+	
I. Heat and infrared radiation	*			*		*				+		+	
J. Light and ultraviolet radiation	*	*	*				*			+		+	
K. High energy waves												+	
L. Chemical energy				+			*			*			*
M. Atomic energy							+			+		+	*

For discussion purposes only

Area and Major Topics	Grade Level												
	K	1	2	3	4	5	6	7	8	9	10	11	12
IV. The Universe (Blue)	+	+	+	+		*	+		*	+			
A. Earth	+	*	*	*		+			+				
B. Moon	*		*			+			+				
C. Sun	*	*	*	*		+			+				
D. Solar system						+			+				
E. Stars and galaxies	*		*	*		+			+				
F. Space travel		+	+	+			*			*			

Key to symbols - - * major emphasis

+ content to be taught

Note: Conservation and safety must permeate science teaching at all grade levels.

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CONCEPTS

A SUMMARY OF THE SUBJECT MATTER CONTENT

GRADE EIGHT

Introduction to science--vocabulary, symbols and mathematics used in science; systems of measurement

Weather and climate--weather fronts, winds and dew points; interaction of earth and air

Geology--types of rocks; indentification of rocks and minerals; chemicals in soils

Astronomy--kinds and problems of optical instruments; theories about origin of solar system; characteristics of earth, moon and sun; units of time; determination of latitude and longitude; methods of grouping stars for study

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Grade Eight

ALLOCATION OF CONCEPTS BY MAJOR TOPICS AND/OR UNITS

TABLE OF CONTENTS

Major Topic and/or Unit	Page Number	Color
Introduction to Science		
Tools of science	1	Gray
I. The Earth		
Weather and climate	3	Red
Geology		
A. Types of rocks	4	Red
B. Changes of the earth's surface	4	Red
C. Chemicals important in soils	5	Red
D. Economically valuable ores and minerals	6	Red
E. Identification of rocks and minerals	6	Red
IV. The Universe		
Astronomy		
A. History of astronomy	9	Blue
B. Tools and laboratories used in the study of the universe	9	Blue
C. Our solar system		
The nearest star, the sun	11	Blue
The earth as a planet	12	Blue
The earth's satellites	13	Blue

TABLE OF CONTENTS

Major Topic and/or Unit	Page Number	Color
IV. The Universe (continued)		
Astronomy		
C. Our solar system		
Movements of the planets, meteors and comets............	14	Blue
D. Measurement of time.............	15	Blue
E. Measurement of longitude and latitude.........................	15	Blue
F. Beyond the solar system.........	16	Blue

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Grade Eight

ALLOCATION OF CONCEPTS BY MAJOR TOPICS AND/OR UNITS

Note: This report presents a list of unit titles or major topics within which the order of the concepts found in the Handbook has been changed and grouped under subheadings to provide a logical teaching approach.

Introduction to Science

Tools of science

1. Scientific knowledge may be expressed both qualitatively and quantitatively.

2. Scientists use symbols in order to express ideas.

3. Systems of measurement are arbitrary.

4. There are two commonly used systems of mathematical measurement, the English and the metric systems.

5. A mathematical system of measurement must be based on exact, reproducible standards.

6. Mathematical expressions are the most accurate way of stating scientific ideas and relationships.

7. Most physical measurements are combinations of simple, direct measurements, and appropriate units may be derived for convenience.

8. Measurements of length, mass and time make direct reference to various adopted standards.

9. The unit for measuring time is the same in metric and English systems.

10. The metric system is based on multiples of 10, similar to our monetary systems.

11. The system of equivalents in the metric system is easier to use than the English or apothecary system of equivalents.

12. The old meter length was based on the distance from the North Pole to the equator, while the new meter length is defined in terms of the wave length of a specific reproducible light wave.

13. Quantities measured in units of a number system may be changed to other units within the same number system.

14. The conversion between units in the metric system is easier than conversion in the English system.

15. Measured quantities may be changed from one kind of unit in one number system to another unit in another number system.

16. Units of measurement may differ between experiments, but if a comparison is to be made, similar units must be used.

17. The conversion of units of measurement from one system to another may result in a system of equivalents.

18. Metric-English and English-metric equivalents may be calculated and may be used to convert from one system of energy units to another.

19. The English system of measurements is less convenient to use than the metric system because of the lack of pattern in the conversion system.

20. In the metric system, it is easy to convert from cubical linear measurement into volume; e.g., cubic millimeters, centimeters, or decimeters to liters vs. cubic inches, feet, or yards to gallons.

21. The English system is based on common fractions rather than decimals.

22. Special facilities, equipment, tools and supplies may increase the amount of control and accuracy with which an observation can be made.

23. A variety of scientific equipment may aid scientific discovery.

24. Many scientific investigations require the development of new instruments.

25. Scientific investigations necessitate the development of new symbols, words and phrases to express scientific ideas.

26. Scientists use a vocabulary which expresses ideas clearly and accurately.

27. Scientific phenomena are more clearly expressed and recorded when a scientific vocabulary is used.

28. Some experiments may be conducted with the equipment which is easily available while others may require development of special equipment.

29. New and refined tools for more accurate measurements are being developed.

I. The Earth

Weather and climate

1. Prehistoric changes in the earth's climate are shown chronologically in the fossil records and in glacier borings.

2. Chemical changes in rock are caused by exposure to the elements of weather.

3. Changes in weather usually occur along fronts that develop where air masses of different temperatures meet.

4. A cold front that overtakes a warm front forms an occluded front.

5. A stationary front is formed when an advancing cold or warm front stops.

6. The temperature of the air is influenced by the temperature of the water and ground directly below it.

7. The moisture content of the air is influenced by the temperature and amount of moisture of the earth directly below it.

8. The temperature at which air becomes saturated with water vapor is called the dew point.

9. When air is cooled below the dew point, water vapor condenses to form dew, frost, fog, clouds, and various forms of precipitations; e.g., mist, sleet, hail, snow.

10. Winds and/or smaller currents of air may flow with irregular motion with mixing, twisting and melting of sub-currents or eddies (turbulence).

11. Local surface winds usually are different from upper altitude winds.

12. Fast moving air currents are found just above the troposphere.

13. High velocity airstreams sometimes occur in certain regions of the lower stratosphere (jet streams).

14. Aircraft should usually be navigated to avoid weather conditions which would subject them to extreme stresses; e.g., thunderstorms, tornadoes.

Geology

A. Types of rocks

1. Sediments are deposited in distinct layers, and usually the layers are recognizable in the resulting sedimentary rocks.
2. Usually the particle size in a layer of sedimentary rock is uniform throughout.
3. Often geologists are able to identify sedimentary rock masses of the same origin in widely separated locations by comparison of the particle size.
4. Petrified wood is a sedimentary rock.
5. In igneous rocks the grain size is indicative of conditions under which the molten material solidified.
6. Some rocks are used for ornaments.

B. Changes of the earth's surface

1. Physical characteristics of the earth are measurable.
2. Many kinds of forces are changing the earth"s surface.
3. The earth's crust which is many miles deep, is being explored by scientists for new knowledge.
4. Energy from within the surface of the earth causes volcanoes, geysers and earthquakes on the surface crust.
5. Water attempts to seek its own level in the crust of the earth.
6. Wave action on the shores of lakes and streams continually changes the shore.
7. The ice which forms on bodies of water during the winter expands and pushes up ridges of sand and soil on the shore.
8. Glaciers are classified according to size.
9. Some changes on the earth's surface are caused by faulting or upheaval
10. Valleys may be formed by the folding and faulting of the earth's crust.
11. Mountains are formed by faults with slippage and by an upheaval of the earth's crust.

12. Man determines the density of the earth's core or interior by means of the speed at which sound waves travel through it.

13. Tabular intrusions (dikes, sills) of molten rock may form in layers of fractures of older rocks.

14. Domes are formed when the surface of the earth is raised by the intrusion of lens shaped masses of igneous rocks (laccoliths) or by the formation of anticline folds which are not linear.

15. The effect of extreme temperature changes in rugged terrain results in talus heaps.

16. Hot pools and geysers are found in regions where cooling igneous rock transfers its heat to small quantities of underground water.

17. Geysers are the result of the release of the pressure of steam and superheated ground water through narrow vents on the surface of the earth.

18. Volcanoes and geysers form natural steam which may be used by man as a form of energy.

19. Oceans or seas usually are formed by gradual sinkingof large areas of the earth's surface.

20. Limestone may form on the bottom of shallow seas (less than 600 feet drop).

21. Large areas of the earth may sink away or be lifted (warping).

22. Man measures geological eras (time) by the extreme changes that occur on the earth.

C. Chemicals important in soils

1. The elements in soil may be determined by chemical examination.

2. Some chemicals important to plant growth are: phosphorous, potassium, nitrogen, dissolved carbon dioxide (acidity) and calcium carbonate (alkalinity).

3. The root systems of living plants increase in size and loosen the ground which enables water to sink into soil.

4. The ground water is an enormous reservoir for the storage of water.

D. Economically valuable ores and minerals

1. A mineral is an inorganic chemical element or compound occurring naturally in the earth's crust.

2. A mineral is a product of inorganic processes.

3. Minerals are natural chemical compounds which usually are of economic value to man.

4. Some minerals which are soluble in water have a distinctive taste.

5. The transparent sheets of some minerals are able to rotate the plane of polarized light.

6. Because some minerals are insulators, they may be rubbed with another insulator and become electrically changed.

7. An ore usually is a mixture of many minerals.

8. Some ores are pure minerals.

9. Ores are usually commercially valuable sources of metals.

E. Identification of rocks and minerals

1. The determination of the hardness of a mineral may be used in identification.

2. Certain powdered materials, when heated in a flame, emit visible light of a definite color.

3. Some minerals when heated emit visible light.

4. Ultraviolet radiation on some mineral substances causes them to give off visible radiation.

5. In all pure minerals there is a definite arrangement of molecules and ions in a crystal lattice.

6. In any pure crystalline sample of a mineral the angles formed by the crystal faces are characteristic and aid in identification of the sample.

7. The borax bead test and the flame test may be used to identify metallic minerals.

8. The magnetic characteristics of a rock may be used in identification.

9. Many minerals break along characteristic cleavage planes.

10. The specific gravity of a mineral may be used in its identifications.

11. Some minerals do not break along definite fracture planes.

12. Only a few minerals are readily soluble in water.

13. Some radioactive ores and minerals emit high energy waves which may be detected.

14. The luster of a mineral may be a characteristic which contributes to the identification of that mineral.

15. The color which the streak test shows is valuable in identifying some minerals.

IV. The Universe

Astronomy

A. History of astronomy

1. Early scientists made many false assumptions.
2. The pseudo-science of astrology is a result of attempting to connect astronomical observations with superstitions.
3. Man's knowledge has gradually increased resulting in more accurate assumptions, experimentation, and conclusions.
4. According to the Copernicum theory (heliocentric), the sun is the center of the solar system.
5. Galileo was one of the earliest experimental astronomers who made very accurate observations and recorded them.

B. Tools and laboratories used in the study of the universe

1. Man through his progress in scientific investigation has developed many instruments to give him further knowledge of the universe.
2. The telescope is one of man's most important tools in observing astronomical bodies.
3. Binoculars and field glasses are constructed with two parallel telescopes.
4. The largest astronomical telescopes must be manipulated with electrically driven machinery.
5. The production of extremely large mirrors and lenses to be used in telescopes requires high technical skill.
6. Most of the largest astronomical telescopes are equipped with cameras for making recorded observations.
7. Man through very accurate observations is extending his knowledge of the universe.
8. The atmosphere of the earth distorts many astronomical observations.
9. In order to prevent atmospheric distortion of astronomical observations, high altitude balloons, rockets, and artificial satellites are being used as platforms for making and recording observations.

10. Man's knowledge of the universe continues to increase as more and more observations are made beyond the earth's atmosphere.

11. As man develops better telescopes, his identification of more astronomical bodies increases and his knowledge about them expands.

12. Planetariums are complex optical instruments which show the relationships of astronomical bodies by means of projected light on a dome-shaped screen.

13. Man-made star maps aid in locating prominent astronomical bodies in the sky at night.

14. As detecting and observing devices become more sensitive and accurate, the knowledge of the universe increases.

C. Our solar system

The nearest star, the sun

1. There are many theories as to the origin of the earth.
2. There are many theories concerning the origin of the sun and the earth.
3. The sun is the likely original source of the materials in the astronomical bodies which make up the solar system.
4. The sun is close enough so that it may be observed more accurately than any other star.
5. The sun's brightness can be compared with that of other stars--"medium" brightness.
6. The sun's size can be compared with that of other stars--"medium" size.
7. The sun's temperature can be compared with that of other stars--"medium" temperature.
8. The sun, as a member of the Milky Way galaxy, moves through space with the galaxy.
9. The sun and the other stars within the Milky Way galaxy move around the center of the galaxy in a definite direction and path.
10. The sun has periods of greater activity during which sunspots may be seen.
11. Aurora Borealis and Aurora Australis are the result of high energy particles coming to the earth from the sun during the periods following the sun's greater activity.
12. About three days after sunspots are observed, magnetic storms occur and the Auroras are visible at night.
13. The measurement of the speed of rotation of the sun is usually calculated by the study of the position of specific sunspots.
14. Solar energy reaches the earth in various forms of radiant energy.
15. Solar storms (sunspots) appear to occur in repeating time intervals.
16. Matter in the sun is being changed into forms of energy.

17. Combination or decomposition of atomic nuclei produce radiant energy.

18. There appears to be "bursts" in the amounts of energy radiated by the sun.

19. The sun is slowly using up its energy potential.

20. The sun's energy is formed by nuclear transformation $E=MC^2$.

C. Our solar system

The earth as a planet

1. The position of the earth in the solar system makes conditions optimum for life as it exists on earth.

2. Daylight is the result of the sunlight falling on the earth's atmosphere and surface.

3. The atmosphere of the earth acts like a blanket in conserving the heat supplied by the sun.

4. A planet cannot have seasons unless the axis on which it rotates is at an angle other than 90° or 180° to the plane of its orbit.

5. The rotation of the earth causes the deflection (coriolis effect) of the north and south air currents on the surface of the earth.

6. The earth has many other movements in addition to rotation and revolution.

7. The earth follows the sun through outer space.

C. Our solar system

The earth's satellites

1. The study of the composition of the moon may be made by spectroscopic analysis.

2. Because of its small gravitational pull, the moon does not have an atmosphere.

3. The moon, the asteroids and Mercury are too small to hold an atmosphere.

4. It is assumed that a part of the surface of the moon is covered with a layer of dust.

5. The surface of the moon is very irregular.

6. The moon rotates and revolves around the earth in a counterclockwise motion as assumed to be viewed from above the north star (polaris).

7. The gravitational effect of the earth keeps the moon in its path.

8. The amount of the moon visible at any one time depends on the relative positions of the sun and the moon in respect to the earth.

9. As the moon orbits the earth the amount of the moon's surface made visible to the earth progressively increases to a maximum or full moon and then decreases to a minimum or the new moon.

10. The moon and the inner planets of the solar system exhibit the same phases or differences in shapes as viewed from the earth.

11. The eclipse of the sun is the result of the moon being in such a position that its shadow is cast on a small area or path on the earth's surface.

12. Earth circling satellites are held in orbit by an equality between the centripetal force (gravity) and angular momentum of the satellite which has been incorrectly called centrifugal force.

13. Balanced forces keep astronomical bodies and artificial satellites in orbit.

C. Our solar system

Movements of the planets, meteors and comets

1. There is a regularity in the orbital motion of the planets.

2. Since planets move at different speeds, around different sized orbits, their movements may not appear to be orderly.

3. The farther away a planet is from the sun, the slower its speed in orbit.

4. Planets further from the sun than the earth appear to move in opposite directions back and forth in the sky over a period of time.

5. When viewed from the earth on successive nights, many planets appear to move eastward through the constellations.

6. All orbits of the planets in the solar system are in approximately the same plane.

7. The revolution of the planets in their orbits is in the same direction as that of the earth.

8. The movement of some larger and/or nearer planets may be observed without the use of a telescope.

9. The type of apparent planetary motion (inferior vs. superior) depends upon the position of its orbit to that of the earth's orbit in the solar system.

10. The apparent motion of an astronomical body is the result of the movement of the observer and the observed.

11. Planets between the earth and the sun display phases similar to those of the moon.

12. The occurrence of meteor showers can be predicted.

13. Comets are a part of the solar system and revolve around the sun in huge, extremely elliptical orbits.

D. Measurement of time

1. The units of time are accurately determined by astronomical events.

2. Different astronomical events are used to define different units of time.

3. Time may be measured in different units.

4. Clocks and watches are used to indicate the passage of time because astronomical events are inconvenient as timing devices.

5. Usually used devices for indicating the passage of time are inaccurate.

6. Because the force of gravity varies at different places on the surface of the earth, pendulum clocks do not keep accurate time unless adjusted for each location.

7. Direct rays of the sun are those which are perpendicular to the curvature of the earth.

8. The time when the sun's direct rays cross the equator is called the equinox.

9. The solstices are the times of the year when the sun is the furthest north and south of the equator.

10. The length of a day varies at different latitudes.

11. The length of a day varies with the time of year.

E. Measurement of longitude and latitude

1. In locating places, the northern one-half of the earth is very often referred to as the Northern Hemisphere and the southern one-half as the Southern Hemisphere.

2. Navigation on the surface of the earth depends on the apparent "fixed" position of stars.

3. "Latitude" is an expression of position on the surface of the earth found by observation of astronomical bodies.

4. "Longitude" is an expression of location or position on the earth, measured by time differences from a set point on the surface of the earth.

5. A sextant is usually used to "shoot the sun" in determining the longitude and latitude of a specific place at a specific time.

6. Everything within our universe may be located as a position in space.

F. Beyond the solar system

1. The universe is made up of space and matter.

2. Statistically the existence of planets in other solar systems with life similar to that on earth is possible.

3. If another planet in any solar system has similar characteristics to those of the earth, life may exist.

4. Sudden and great changes in an astronomical body's characteristics have been observed, but the occurrence is not frequent.

5. The universe appears to have no boundaries (infinity).

6. Since the universe appears to have no boundary, it is not known how many astronomical bodies exist.

7. Nebulae are clouds of gas and/or dust which may be illuminated by nearby stars.

8. The speed of movement of a light-emitting body going away or coming toward the observer causes a shift in the frequency of the light (color) emitted--Doppler Effect.

9. The enormous quantities of energy which most stars give off is produced as a result of nuclear fusion reactions.

10. Stars may be grouped by their brightness (magnitude) or chemical composition.

11. Stars are often grouped for study on the basis of their apparent atomic composition.

JHS:gm
8-2-63

LEARNING
EXPERIENCES

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU
December, 1959

When you no longer need this Please return it to
Office of the Consultant in Science,
Mpls. Public Schools

0-4.12

L. S. 5927

CRITERIA FOR THE EXPOSURE OF WEATHER INSTRUMENTS

Precipitation Gages

Precipitation gages should be located on a level plot of ground, at a distance from any object (including the instrument shelter) of at least two, and preferably four, times the height of the object above the top of the gage. All types of gages must be exposed with the rim of the receiver in a horizontal plane and at a level well above the average level of snow surfaces. Rain gages should not be installed on a roof.

When objects, which individually or in small groups would constitute obstructions, are numerous and are so extensive that the prevailing wind speed and, as a consequence, the turbulence and eddy currents have been reduced in the vicinity of the gage, the presence of such objects are usually beneficial in providing a more accurate catch. The best exposures are often found, therefore, in orchards, openings in a grove of trees, bushes or shrubbery, or where fences and other objects acting together serve as an effective windbreak. As a general rule in such areas where the height of the objects and their distance from the gage is generally uniform, their height above the gage should not exceed about twice their distance from the gage.

Instrument Shelters and Temperature Equipment

Wherever possible, shelters will be installed over earth or sod at least 100 feet from any concrete or other hard surfaced area, and not closer to any other object than four times the height of the object above the floor of the instrument shelter. Avoid roof installations if possible. However, if it is necessary to locate the shelter on a roof, it should not be closer than 30 feet to any large, vertical reflecting surface (walls, etc.), exhaust fans, or cooling towers. The floor of the instrument shelter should be approximately four feet above the ground or roof, except that, if the shelter is mounted above a roof, the height may be greater than four feet in order to minimize radiation effects from the roof. To afford the interior of the shelter the greatest protection from direct solar radiation while the door is open, orient the shelter with the door facing north (in the Northern Hemisphere). Keep the shelter door closed when the instruments are not being read.

If illumination is desired in the shelter use an electric lamp of not more than 25 watts. Keep the lamp as far as practicable (at least ten inches) from any temperature-sensing element. Do not leave the lamp turned on any longer than is necessary to read the instruments.

In general, temperature-sensing elements will be mounted as close to the center of the shelter as practicable, and in a position where the operation of one instrument will not interfere with the operation of another. In any case, the temperature-sensing units will be mounted more than four inches from the sides, top, and bottom of the shelter.

Aneroid Barometers

Select a site where the instrument will not be subject to rapid fluctuations of temperature or to jarring and continuous vibration. Avoid exposing the instrument to direct sunlight or radiant heaters, and to direct drafts, such as open windows and doors.

Aneroid barometers should, under ordinary circumstances, be mounted with the dial in a vertical position at a convenient level for reading. They will, however, operate satisfactorily in other than a vertical position. Dial-type instruments are frequently provided with a detachable case or flange to be used when the instrument is wall mounted.

Wind Equipment

So far as available sites permit, wind sensing equipment should be placed 20 feet above the ground on a freely exposed tower, and over terrain that is relatively level and free from obstructions to wind flow. In general, obstructions include hills or other objects whose height above the ground at the exposure site is not more than one tenth their distance from the site. Avoid sites where topography or other obstructions are known to create appreciable up-or-down drafts, eddy currents or jet-flow effects. When a compromise must be made, the sensing units should be exposed at least 12 feet above any obstruction within 100 feet, and at least as high as any obstruction within 100 to 200 feet of the wind equipment. Supporting towers should not be of such bulk or shape as to create an appreciable obstruction to the wind flow.

Abstracted from Paragraphs A4410, A5519-21, A7030, A7031 and A8110 of the Weather Bureau Addendum, Manual of Surface Observations, Circular N, Sixth Edition Revised, November 1951.

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU

L. S. 5806

0-4.12
April 1958

WEATHER BUREAU TYPE METEOROLOGICAL INSTRUMENTS FOR PRIVATELY OWNED WEATHER STATIONS

There is a wide variety of excellent recording and non-recording meteorological instruments on the market. The most commonly used instruments of the Weather Bureau type for small weather stations are illustrated in this circular. All instruments need not be installed at each station. Wind speed and direction and precision pressure measuring equipment is not listed because it is generally installed at the more complex weather stations.

NON-RECORDING METEOROLOGICAL INSTRUMENTS

Observations from non-recording instruments are read manually and reflect conditions at observation time only.

Temperature - The highest and lowest air temperatures are read from special thermometers enclosed in a white shelter that permits air to circulate freely around them and at the same time shields them from rain and the sun's rays. Current air temperatures are read from a thermometer enclosed in the same shelter.

INSTRUMENT SHELTER AND SUPPORT

CURRENT AIR THERMOMETER

MAXIMUM AND MINIMUM THERMOMETERS AND SUPPORT

The MAXIMUM THERMOMETER, a mercury-in-glass type, is very similar to the common clinical thermometer. A constriction in the bore prevents the mercury from returning to the bulb when the temperature decreases so that the thermometer indicates the highest temperature attained.

The MINIMUM THERMOMETER, an alcohol-in-glass type, has a small dumbbell shaped piece of glass called an "index" in the bore. As the temperature falls the top of the alcohol column carries the index with it towards the bulb. When the temperature rises again the alcohol flows freely around the index, leaving it to mark the lowest temperature reached.

8-INCH RAIN AND SNOW GAGE

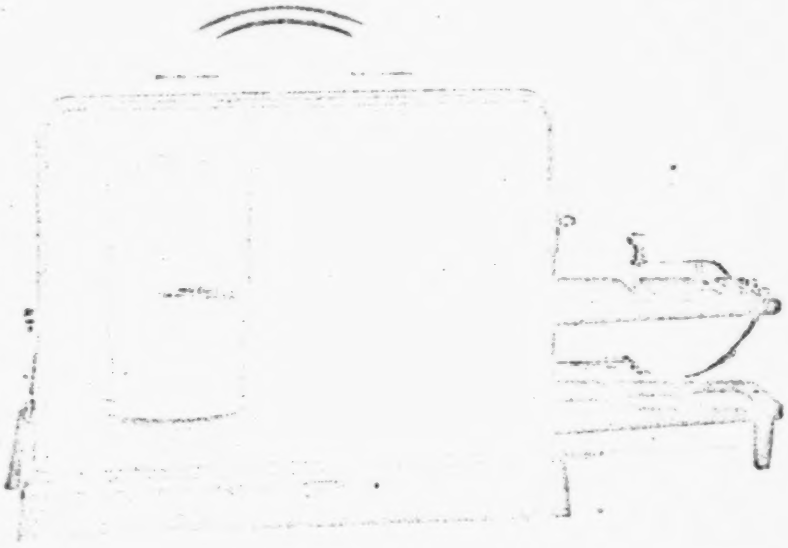
In this gage the precipitation is collected in a small vertical tube inside a large outer tube or overflow can and is measured with a graduated stick. The area of the inner tube is one-tenth the area of the outer tube to magnify the depth of the catch and thereby make possible accurate measurement of precipitation to 1/100 inch.

ANEROID BAROMETER

The type illustrated here will satisfactorily indicate rising and falling pressure and the amount of day to day pressure changes.

RECORDING METEOROLOGICAL INSTRUMENTS

Below are illustrated the simpler instruments for continuous records of precipitation, temperature and relative humidity. For accuracy, recording instruments should be checked periodically against a standard and be recalibrated if necessary.

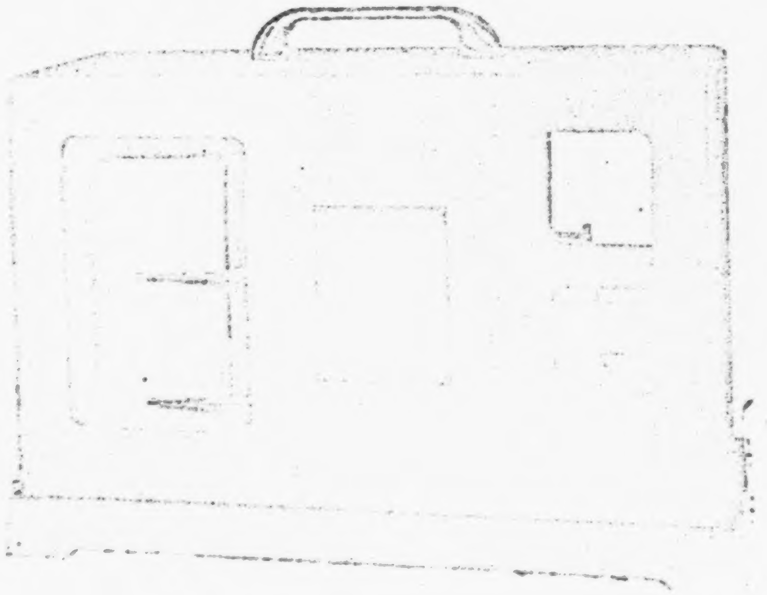


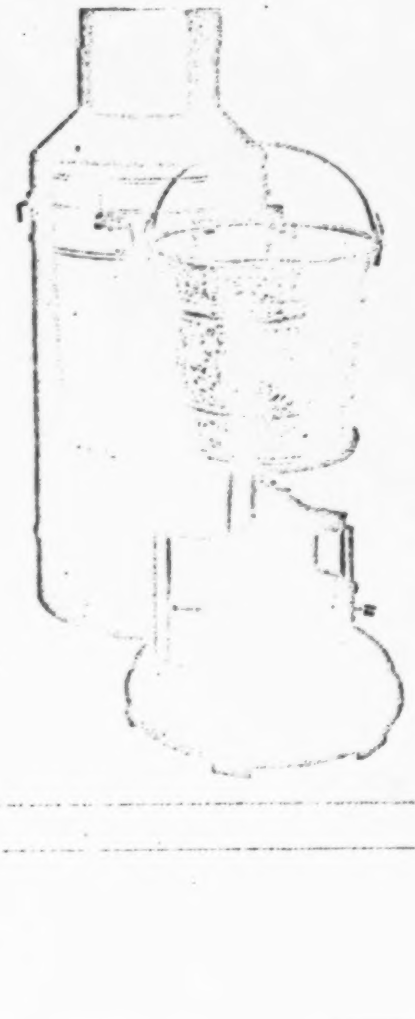
THERMOGRAPH

Temperature is measured and recorded as a continuous line on a clock driven chart. The expansion and contraction of a bi-metallic strip or Bourdon tube with changing temperature moves a pen which traces the record. It is recommended that at least weekly comparisons be made with a mercurial thermometer.

HYGROTHERMOGRAPH

This instrument measures relative humidity and temperature and records them on a single chart in the same way as a THERMOGRAPH. The expansion and contraction of a human hair element with changing relative humidity moves a pen which traces the humidity record. It is recommended that at least weekly comparisons be made with a psychrometer.





WEIGHING TYPE RECORDING RAIN AND SNOW GAGE

In the WEIGHING TYPE RECORDING RAIN AND SNOW GAGE, the weight of the precipitation falling through the circular opening in the gage is recorded on the chart as depth of water in inches and hundredths.

MINERAL IDENTIFICATION CHART

MINERAL	HARDNESS	COLOR	STREAK	LUSTER	SPEC. GRAVITY	FUSIBILITY	FORMULA	ACID	BEAD	SPECIAL PROPERTIES
Quartz	7	Clear White Pink Smoky	None	Vitreous	2.65	No	SiO_2	No	No	Crystals in form of hexagonal prisms and pyramids. Colors due to impurities as quartz is colorless.
Feldspar	6	White Pink Gray	White	Vitreous	2.57	5		Insoluble	No	
Hornblende	5–6	Dark green to Black	No	Vitreous or Silky	3.2	4	Variable	No	No	Yields water when heated in a test tube.
Calcite	3	Clear White Blue	White	Vitreous to Earthy	2.72	No	$CaCO_3$	Strong reaction Bubbles in HCl	No	Transparent to opaque. Hexagonal crystal. Crystal has property of double refraction.
Limonite	5–5.5	Brown	Yellow-brown	Dull-earthy	3.6–4.0	5–5.5	$2Fe_2O_3 \times 3H_2O$	No	Yellow–Hot Green–Cold	Yields water when heated in a test tube. Magnetic after heating. Massive, fibrous or porous.
Bauxite	1–3	White Gray Yellow Red	Brown	Earthy	2.0–2.55	No	$Al_2O_3 \times 3H_2O$	Insoluble	No	Yields water when heated in a test tube. Moisten with cobalt nitrate and specimen gives off a blue flame upon burning. Chief ore of aluminum. Earthy odor.
Pyrrhotite	4	Brownish-bronze	Black	Metallic	4.58–4.65	3	Fe_5S_6 to $Fe_{16}S_{17}$	Soluble in Conc. HCl	Yellow–Hot Green–Cold	Decomposes in conc. HCl. Gives off hydrogen sulfide gas. Only magnetic sulfide.
Cinnabar	2.5	Red	Red	Adamantine	8.10	No	HgS	No	No	Black sublimate in a test tube. When mixed with sodium carbonate in a tube, it gives off globules of mercury. Cinnabar tastes chalky.
Stibnite	2	Gray to Black	Gray to Black	Metallic	4.52–4.62	1	Sb_2S_3	No	Yellow–Hot Colorless–Cold	If heated in a test tube and then cooled, it gives one ring of yellow above and one ring of red below. Tarnishes black.
Gypsum	2	White	White	Vitreous and Pearly	2.32	3	$CaSO_4 \times 2H_2O$	Hot	No	Heated in test tube, it turns white, yields much water.
Azurite	3.5–4	Blue	Blue	Vitreous	3.77	3	$2CuCO_3 \times Cu(OH)_2$	Yes	Green–Hot Blue–Cold	Gives green solution in HCl. Add ammonia and it turns deep blue.
Tourmaline	7–7.5	Black, or Brownish to Bluish-black	Uncolored	Vitreous to Resinous	2.98–3.20	Difficult	$(NaLiK)_6(MgFeCa)_3(AlCrFe)_2B_2SiO_5$	No	No	Crystals prismatic, slender to barrel-shaped. Becomes electric by friction. In granite, gneiss.
Chalcopyrite	3.5–4	Brass-yellow	Greenish-black	Metallic	4.1–4.3	No	$CuFeS_2$	Decomposed by Nitric acid	Magnetic bead	Often mistaken for gold but brittle. Important copper ore. Crystals commonly tetrahedral.
Mica (Muscovite)	2–2.5	Yellowish-white	White	Vitreous to Pearly	2.8–3.0	No	$H_2KAl_3(SiO_4)_3$	No	No	Monoclinic, thin plates, flexible, clear.
Pyrite	6–6.5	Brass-yellow	Greenish- or Brownish-black	Metallic	5.0	2.5–3.0	FeS_2	Insoluble in HCl	No	Magnetic when heated. Fine powder solution in strong nitric acid. Commonly in cubes. "Fool's gold."
Halite	2.5	White	White	Vitreous	2.1–2.6	Colors flame deep yellow	$NaCl$	See properties	No	Dissolves in water. Salty taste. Usually in cubes.
Galena	3.0	Lead-gray	Lead-gray	Metallic	7.4–7.6	Easily	PbS	Nitric acid	Globule Metallic lead	Soluble in strong nitric acid. Commonly in cubes as crystal. Note spec. gravity and color.

Pages 218-219 from Raymond Barrett - "Build-It-Yourself Science Laboratory"

BIBLIO. BOOKS

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2-3422	---	TEACHERS MANUAL 1959		.72	---

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A SELECTIVE BIBLIOGRAPHY

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Astronomy	13	Blue

The annotations for books found on the following pages were obtained from many bibliographies which were consulted in the preparation of this list.

I. The Earth

Weather and climate

Adler, Irving 1959

WEATHER IN YOUR LIFE

Day $3.00

A clear, well organized treatment of weather phenomena, their causes and effects and short and long range weather forecasting. Air, water, land, and the sun's heat -- factors which influence the weather, are explained simply. Adler shows how these factors combine to cause changes in our environment. Cartoon-like sketches explain such phenomena as the winds of a hurricane, how a tornado is formed, etc. Photographs of cloud formations are included.

Battan, Louis 1964

THE THUNDERSTORM

Signet $.60

Describes what science has learned from studying storm generating clouds.

Burnett, Lehr, Zim 1957

WEATHER

Golden Press $2.99

This is a pocket-sized book containing all sorts of facts about the weather -- how rain, snow and hurricanes form; why the seasons come to pass; meteorological instruments, and many others.

Bell, Thelma Harkington 1960

THUNDERSTORM

Viking $3.00

The author investigates the nature, causes, and manifestations of thunderstorms. With interesting anecdotes, she describes the building of a thunderhead and types of thunderstorms. She tells about early superstitions, recounts the experiences of men who have flown inside a thunderhead, explains what lightning is, traces the progress of scientific knowledge about lightning, and discusses the dangers and virtues of thunderstorms.

1. The Earth - Weather and climate (continued)

Fenton, Carroll Lancer and Mildred A. 1954

OUR CHANGING WEATHER

Doubleday $3.50

A fairly simple explanation of weather phenomena and their causes. Air, heat, water, and earth are explained in relation to their effect on weather. Certain aspects of weather such as clouds, haze, fog, rain, thunder and lightning, snow, dew, and frost are explained. At the end there is a section on weather prediction and how to read weather maps. The material is accurate.

Gallant and Hess 1957

EXPLORING THE WEATHER

Garden City $3.25

This is the story of weather -- its formation and development from fogs to hurricanes -- its old superstitions and modern forecasting methods.

Knight, David 1964

THE SCIENCE BOOK OF METEOROLOGY

Watts $4.95

The subtitle to this book -- An Introduction to the Atmosphere and its Phenomena -- is a good annotation. This volume is up to date in all its presentations including such current topics as the "Greenhouse Effect", Van Allen radiation belts, weather satellites, jet streams, air pollution, and The World Meteorological Organization.

Laird, Charles and Ruth 1955

WEATHERCASTING

Prentice-Hall $3.95

This book tells the story of weather and how you can learn to observe and forecast it. By following these simple step-by-step instructions, you will be able to make scientific predictions based on information obtained from your own observations and instruments you have had the fun of building. These predictions will not be haphazard guesses.

I. The Earth - Weather and climate (continued)

Orr, Clyde

BETWEEN EARTH AND SPACE

Macmillan $4.95

Suggested, particularly for secondary science, as an understandable and informative discussion of the earth's atmosphere and the various phenomena related to it.

Sloane, Duell and Pearce 1952

ERIC SLOANE'S WEATHER BOOK

Little, Brown and Company $4.50

An artist who has specialized in weather . . . explains isobars, fronts, masses, clouds, etc. in words and more than eighty drawings.

Spilhaus, Athelstan F. 1951

WEATHERCRAFT

Viking $2.00

This is an account of how to assemble and operate a home weather station. The author shows how easily the instruments can be assembled. A rain gauge is made from a tin can, an anemometer for measuring wind speed from an egg beater. Most of the materials can be found around the house, and nearly all the rest can be bought at a five and ten cent store.

Tannehill, Ivan Ray 1953

ALL ABOUT THE WEATHER

Random House $2.37

In readable style and with scientific accuracy, the director of weather reporting and forecasting for the U. S. Weather Bureau discusses the factors of weather and the results of their interaction, and explains the work of weathermen in observing, measuring, reporting, predicting and warning.

I. The Earth

Geology

Baity, Elizabeth Chesley 1953

AMERICA BEFORE MAN

Viking	$5.00

A record of the development of geological and life forms as they have had bearing on our Western Hemisphere. Starting with the creation of the earth, itself, there follows material on land formation, first life, fossils, invertebrates, land and air reptiles, early mammals, the ice age, and man.

Beiser, Arthur 1962

THE EARTH

Time, Inc.	$3.95

This is a well illustrated history of the Earth with contents as follows: a small but extraordinary planet; cloudy beginnings; anatomy of the skies; the emergence of the crust; shaping of the landscape; the record of the rocks; an uncertain destiny; bibliography; a geologic tour of the United States.

Carson, Rachel 1958

THE SEA AROUND US

Golden Press	$4.99
(also available in Signet)	.60

This is an excellent adaptation. Oversize pages display to advantage an impressive collection of drawings, photographs, maps and charts. Most of these are in color. Many young readers who might not otherwise read this fine book will be attracted by the format. Some of the topics explored are the formation of oceans, the tides and currents, marine flora and fauna, the ocean floor and volcanic activity, products obtained from the sea, and others.

Clarke, William D. 1961

OCEANS, STREAMS AND GLACIERS

Hart	$3.95

Tides, waves, ocean currents, ocean life, glaciers and ice bergs are discussed. Striking illustrations and maps.

I. The Earth - Geology (continued)

Coleman, Satis N. 1946

VOLCANOES, NEW AND OLD

Day $4.50

This story of volcanic phenomena has brief scientific background. The main part of the book consists of descriptions of volcanoes in all parts of the world, their history of eruption and destruction, and in particular, Paricutin, the volcano which was born in Mexico in 1943, and which in four months grew a cone of 1,000 feet -- also the still threatening Vesuvius.

Engel, Leonard 1964

THE SEA

Silver Burdett Co. $3.95

This book is a member of the Life Nature Library Series. It reviews the life of the sea -- its beginnings, its development, and its present day forms. The mapping and exploration of the ocean bottom is covered and includes a unique map. Other topics considered: ocean currents, waves and tides, the chain of life, killers of the sea, and man's future and the sea.

Epstein, Samuel and Beryl 1957

PREHISTORIC ANIMALS

Watts $3.95

A clear, well-rounded treatment which covers the subject more fully than do most books in the field for children. Reconstructing the different periods of the prehistoric past, the book describes the animals that existed in each, explains how they adapted themselves to the ever-changing environment, evolved, survived, or became extinct; also shows the role of the scientist in piecing together the puzzle of the past.

I. The Earth - Geology (continued)

Fenton, Carroll Lane and Mildred Adams Fenton 1958

THE FOSSIL BOOK

Doubleday $15.00

This is a survey of the fossil remains of plants, beasts, birds, insects, and various forms of marine and animal life. It progresses from the simplest to the most complex specimens. The Latin name of the genus and species, the geologic age, the geographic range, and the size are generally given for each. The fossils and their restorations are compared, not only with those of other prehistoric creatures, but also with related species which still survive. The book is generously supplied with photographs and drawings which are well coordinated with the text. It will be most useful as a reference work or student guide.

Fenton, Carroll Lane and Mildred Adams Fenton 1940

THE ROCK BOOK

Doubleday $8.95

A useful, popular manual on the rocks and important minerals of the world. Partial contents: Rocks in our world; Atoms to minerals; Important minerals; Coarse-grained igneous rocks; Fine-grained, glassy, and fragmental rocks; Rocks from the sky; Clastic rocks; Rocks from solutions; Limestone and related rocks; Records in strata; Ores and their origins.

Fenton, Carroll Lane and Mildred Adams Fenton 1951

ROCKS AND THEIR STORIES

Doubleday $3.50

With constant reference to the photographs, the authors define the difficult distinction between "rocks" and "stones". They discuss rocks and the minerals of which they are composed. They give descriptions of well-known minerals, various forms of lava, other kinds of eruptive rock, granites, sediment and strata, unconsolidated sedimentary rocks, and the story of the variations in rock soil surfaces. This is a sound introduction to correct scientific nomenclature.

I. The Earth - Geology (continued)

Harland, Walter Brian 1960

THE EARTH: ROCKS, MINERALS AND FOSSILS

Watts	$4.95

This is a simple introduction to geology which shows what man has learned about the earth from the study of rocks, minerals, and fossils. After tracing the development of geology as a science and printing out some of the problems still unsolved, the writer discusses the structure of the earth and the forces affecting it, the earth's history, and its natural resources. Instructions for the amateur on collecting fossils, minerals, and rocks complete a well-organized and comprehensive overview for readers of junior high age and up.

Milne, Lorus J. and Margery and Editors of Time 1962

THE MOUNTAINS

Time, Inc.	$3.95

This is one of a series in the Life Nature Library. The "birth and death" of mountains is described -- forces of uplift such as folding and faulting, volcanic mountain building, the work of glaciers, etc. The plants and animals of the mountains are included, along with chapters on high mountain civilizations and man's assaults on mountain peaks. A well illustrated book.

Palmer, E. Laurence 1965

FOSSILS

Heath	$1.32

This book is a paperback with more than 200 drawings of fossils and a brief description including the scientific name, size, distribution, and geological period in which they lived.

Pearl, Richard M. 1955

HOW TO KNOW THE MINERALS AND ROCKS

McGraw-Hill	$4.75
(also paperback)	1.95

This book describes the formation of sedimentary, metamorphic, and igneous rock. Most of the text is devoted to the characteristics of the common rocks and minerals.

I. The Earth - Geology (continued)

Pouch, Fredrick H. 1960

A FIELD GUIDE TO ROCKS AND MINERALS

Houghton $4.95

Complete, but compact, this manual of mineral identification, both comprehensive enough for the serious collector and basic enough for the beginner in mineralogy, is ideal for field trips and reference purposes.

Roberts, Elliot 1961

DEEP SEA, HIGH MOUNTAIN

Little, Brown $3.75

Captain Roberts of the U. S. Coast and Geodetic Survey tells fifteen stories of the work of the Survey and of the men who carry it on. He begins with the first hesitant steps under Thomas Jefferson in 1807 when Ferdinand Hassler was commissioned by Congress to undertake a survey of the coast. The obstacles, delays, frustrations, and triumphs (Hassler was apparently responsible for some of each) are swiftly detailed and the importance of the Survey is skillfully emphasized. Later chapters take the reader to the Philippines, to Alaska, to South America, to Hawaii, and on to the high seas. Drawings enliven and clarify the text. Six pages of glossary and index make the book useful for the young reader engaged in a special project.

Reed, W. Maxwell and Paul Brandwein 1960

THE EARTH FOR SAM

Harcourt $4.95

A history of the earth through successive geologic periods from the days "when the earth was hot" ending with an imaginary period which looks forward to our possible future. It covers the animal life as well as the geological formations of each period.

I. The Earth - Geology (continued)

Rhodes, Zim Shaffer 1962

FOSSILS

Golden Press	$2.99
(also in paperback)	1.00

This guide to fossil remains, which tell earth's history, covers representative fossil types of the major geologic periods, describes how fossils can be identified, and shows the typical plant and animal life of geologic periods.

Schwartz, George M. and George A. Thiel 1964

MINNESOTA'S ROCKS AND WATERS

University of Minnesota Press	$3.00

This is a readable and concise description of the geology of Minnesota.

Sevrey, O. I. 1958

THE FIRST BOOK OF THE EARTH

Watts	$2.65

An introduction to geology; how the earth was formed; how mountains, volcanoes and other geological formations occur; and stories of the men important in the history of geology.

Shuttlesworth, Dorothy 1956

THE STORY OF ROCKS

Garden City	$2.95

This pictorial guide describes the formation of igneous, sedimentary, and metamorphic rock. Coral, fossils, and ore are also discussed.

I. The Earth - Geology (continued)

Swinton, William 1961

THE WONDER WORLD OF PREHISTORIC ANIMALS

Garden City $2.95

In text and pictures, this book shows the pattern of life in each age of geological time, and how this pattern slowly changed from the first soft-bodied sea animals of 2,000 million years ago to the mammoths and woolly rhinoceros that the first men hunted. Where-ever man has dug into the earth, he has found strange rocks that look like animals, or parts of animals, made of stone. These are fossils, clues to the history of life in the past.

Tazieff, Haroun 1961

THE ORION BOOK OF VOLCANOES

Orion $2.95

This is a study of one of earth's most fascinating and mysterious phenomena, the volcano -- what it is; how it behaves; what man knows about it.

Watson, Jane Werner 1960

DINOSAURS AND OTHER PREHISTORIC REPTILES

Golden Press $2.95

A well illustrated book which traces the development of prehistoric reptiles and dinosaurs from Paleozoic times to their extinction including descriptions of their environments. The collection and reconstruction of fossil remains is also included.

Watson, Jane Werner 1956

THE WORLD WE LIVE IN

Golden Press $4.99

This is a physical history of the earth, its formation and forms of life. It contains descriptions of creation, plants, animals, early man, the land, sea, and sky. The book has color illustrations on every page, and will serve to stimulate the students curiosity.

I. The Earth - Geology (continued)

White, Anne Terry 1951

PREHISTORIC AMERICA

Random House	$2.28

This book brings to life the story of America before the Indians reached our shores -- when elephants, the brontosaurus, sabre-toothed tigers and horses, no bigger than a fox, roamed our land. The junior high school student discovers the evidence of America's past that makes this bit of history an exciting adventure story. A final chapter explains, with charts, how geological time is measured.

Wyler, Rose and Gerald Ames 1956

THE STORY OF THE ICE AGE

Hale	$1.74

Here is an absorbing account of the various ice ages of the earth. The book begins with a discussion of how man's knowledge of these periods has been acquired and grown through the years, and continues with a discussion of various scientific theories of how the ice ages came about and their effect on plant, animal and human life. There is an excellent description of the cold deserts (the tundra) that have been characteristic of the area bordering ice fields from early times. The book ends with a speculation as to the possibility of an ice age of the future.

Zim, Herbert S. and Paul R. Shaffer 1957

ROCKS AND MINERALS

Golden Press	$2.99
(also in paperback)	1.00

This book illustrates and describes over 400 specimens of minerals and rocks and explains in non-technical terms how to identify them.

IV. The Universe

Astronomy

Atkin, J. Myron and Stanley Wyatt 1961

ASTRONOMY: CHARTING THE UNIVERSE

University of Illinois $1.50

This book is a collection of laboratory experiences in the field of astronomy. Although it might prove most useful in working with a science club or group, because of the necessity for night time observations, it does provide challenging work for the average or above average eighth grade student in astronomy.

Bergamini, David 1962

THE UNIVERSE

Time, Inc. $3.95

Contains: Myths and misconceptions; Probing the universe; Planets meteorites and comets; Biography of the sun; What our galaxy is made of; The birth and death of stars; Beyond the Milky Way; Space time and the universe; Glossary and tables; Bibliography.

Bernhard, Bennet, Rice 1962

NEW HANDBOOK OF THE HEAVENS

Signet $.60

This is a very good reference book for the teacher and student interested in astronomy. The book reviews current knowledge and thinking in astronomy.

Branley, Franklyn M. 1959

EXPERIMENTS IN SKYWATCHING

Crowell $3.50

The young skywatcher is given an introduction to orderly observation of the heavens and to experiments that will be of great interest.

IV. The Universe - Astronomy (continued)

Branley, Franklyn M. 1960

THE MOON: EARTH'S NATURAL SATELLITE

Crowell $3.50

This book is a full presentation of our knowledge about the moon.

Branley, Franklyn M. 1958

THE NINE PLANETS

Crowell $3.50

This book contains detailed descriptions of the planets -- their distance from the sun, temperature, size, rotation period, mass, density, and physical composition.

Brindze, Ruth 1949

THE STORY OF OUR CALENDAR

Vanguard Press $3.50

Here is an expedition back into time to explore the real story behind the neat little calendars we use today. There are some nice bits of information about the early races who were concerned with the calendar -- the Babylonians, the Egyptians and the Romans.

Franklin, K. 1964

BIRTH AND DEATH OF STARS

Doubleday $.50

This book covers one of the major puzzles astronomers have been trying to solve -- how the stars are born, how they produce their energy, and how they die.

Freeman, Mae and Ira 1953

FUN WITH ASTRONOMY

Random House $2.07

Simple experiments and excellent illustrations introduce the reader to the planets, the Milky Way and the expanding universe.

IV. The Universe - Astronomy (continued)

Gallant, R. A. 1962

THE ABC'S OF ASTRONOMY

Doubleday $3.95

Some topics discussed in this book are: Man and the stars; Planets are born; Mercury; Venus; Earth and moon; Mars; The asteroids; Jupiter; Saturn; Uranus; Neptune; Pluto and beyond.

Gallant, R. A. 1956

EXPLORING MARS

Doubleday $2.95

This book contains an excellent view of facts and informed speculation about Mars.

Gallant, R. A. 1955

EXPLORING THE MOON

Garden City $2.00

This oversized book has striking illustrations and concise text describing the origin of the moon, its craters, seas, mountains, and other features according to the theories of various astronomers, and takes the reader on an imaginary trip to the moon to explore its strange surface.

Gallant, R. A. 1958

EXPLORING THE PLANETS

Garden City $2.95

Here are facts about each planet -- its formation, diameter, surface features, moons, rotation period and orbit.

IV. The Universe - Astronomy (continued)

Gallant, R. A. 1958

EXPLORING THE SUN

Garden City $2.50

This book tells you about what the sun does for mankind. Without this "rather ordinary" star, there could be no life of any sort on our planet. It also tells you not only many amazing facts about the sun's composition, but of the tremendous drama of its death billions of years from now.

Lapaz, Lincoln and Jean 1961

SPACE NOMADS

Holiday House $4.50

This book presents a very usable introduction to the study of meteorites.

Lauber, Patricia 1960

ALL ABOUT PLANETS

Random House $1.95

This pictures the major bodies in our solar system and presents a detailed, though not complex, description of the moon, the birth of the planets, and the possibility of life in other solar systems.

Maloney, Terry 1960

THE SKY IS OUR WINDOW

Sterling $3.95

The author presents a non-technical picture of the universe as revealed through the window of the night sky. Moving outward from the earth itself, he tells what is known about the nature and behavior of the moon, planets, sun and other celestial objects in the stellar system, other stars in the galaxy, and other galaxies beyond. He also briefly explains the methods used in astronomical observations.

IV. The Universe - Astronomy (continued)

Mayall, Mayall and Wyckoff 1959

THE SKY OBSERVERS GUIDE

Golden Press	$3.99
(also in paper)	1.00

This book is a handbook for astronomical observation.

Moore, Patrick 1961

PICTURE HISTORY OF ASTRONOMY

Grosset and Dunlap	$6.25

This is a well illustrated book containing topics as follows: The Greek astronomers; The design of the Universe; The story of Tycka Brake; The laws of Johannes Kepler; Telescopes and the stars; Exploring the solar system; The genius of Newton; The royal observatory; How far all the stars; The galaxies; The story of radio astronomy; Rockets into space; Earth satellites; Space probes and luniks.

Pickering, James S. 1961

CAPTIVES OF THE SUN

Dodd, Mead	$4.95

This book contains a general description of the planets, moons, comets and meteors of the solar system.

Piper, Roger 1963

THE BIG DISH

Harcourt, Brace	$3.25

Mr. Schneider takes the reader on a tour of an astronomical observatory and introduces him to what lies outside our world.

Rey, H. A. 1952

THE STARS

Houghton Mifflin	$6.00

A new system of identifying constellations and stars is given and star maps and charts aid the beginner.

IV. The Universe - Astronomy (continued)

Rublowsky, John 1962

IS ANYBODY OUT THERE

Walker & Co. $3.95

This book is an investigation into the possibility of life elsewhere in the universe, progressing from facts about life on the Earth to a journey through space to see what might be found on the moon, the planets, the stars, etc.

Schloat, G. Warren 1958

ANDY'S WONDERFUL TELESCOPE

Scribner $2.97

Andy, like many others today, has a telescope in his back yard. This book tells what he sees, and something about the universe. It also explains simply and pictorially how the telescope was developed and the principles of reflecting and refracting telescopes.

Sullivan, Walter 1964

WE ARE NOT ALONE

McGraw-Hill $6.95

This is a fascinating book, not only as a history of man's longing to reach beyond his world for a better one, but as a report showing just where we are today in an age-old quest with our scientists on the verge of learning the answers.

Zim, Herbert S. 1958

SHOOTING STARS

Morrow $2.75

This is a discussion of the difference between meteors and meteorites and includes a description of the famous meteor showers.

IV. The Universe - Astronomy (continued)

Zim, Herbert and Robert Baker 1956

STARS

Golden Press	$2.99
(also in paperback)	1.00

This book is a pocket guide for anyone who wishes to enjoy the wonders of the heavens.

Zim, Herbert 1953

THE SUN

Morrow	$2.78

This book gives a fascinating view of the sun telling of its production of heat and light, its size as compared to other stars, and its composition.

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Correlated to Junior High Science Content

8th Grade Topics 8th Grade Texts	Introduction to Science	Weather and Climate	Geology	Astronomy
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Lippincott Smith and Jones - '59 Enjoying Modern Science	1- 19	310-375	211-243	176-210
Allyn & Bacon Smith - '60 Our Environment: How We Adapt Ourselves to It	XI-XII	1-131		132-291
Holt, etc. Davis et al - '58 Science Two-Experiment and Discovery		132-161	162-197	94-131
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Heath Fletcher and Wolfe - '59 Earth Science		352-449	3-267 450-502	268-321
Prentice-Hall Ames et al - '56 Science for Your Needs			302-339	4- 47
Scott Foresman Beauchamp et al - '57 Science Problems Two		224-255	132-179	86-131
Harcourt Brace Brandwein et al - '60 You and Your Inheritance	4- 28 479-510		75-124	419-458
Van Nostrand Namowitz and Stone - '60 Earth Science		452-538 552-578	1-319 540-551	320-410

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Supplements				
Civil Air Patrol, Inc. Civil Air Patrol Pamphlets 5-Navigation and The Weather	5			
Rand-McNally Gilman and Van Houten - '57 General Science Today	188-233		234-269	
Holt Brooks and Tracy - '54 Modern Physical Science	38- 51	520-557	558-598	
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Ginn Curtis and Mallinson - '58 Science in Daily Life	135-172	249-280	205-248	
Lippincott Smith and Jones - '59 Using Modern Science		48- 57	57- 72 416-466	
Harcourt-Brace Brandwein et al - '60 You and Science	204-273	159-166 327-349	132-203 625-648	
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Supplements				
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Holt, etc. Fitzpatrick et al - '62 Living Things				
Prentice-Hall Ames et al - '56 Science in Today's World	247-267	172-199	200-227	
Scott Foresman Beauchamp et al - '57 Science Problems One				
Harcourt-Brace Brandwein et al - '60 You and Your World	257-278	318-332	339-392	

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Harcourt-Brace Brandwein et al - '60 You and Your World	257-278	318-332	339-392	

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MINNEAPOLIS PUBLIC SCHOOLS
Science Department

BASIC SCIENCE EDUCATION SERIES USEFUL IN JUNIOR HIGH SCHOOL SCIENCE
(Reading difficulty determined by Winnetka Scale)

GRADE SEVEN

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Plants

Adaptation to Environment - 5.1
An Aquarium - 2.7
Balance in Nature - 6.3
Dependent Plants - 3.7
Domesticated Plants - 6.6
Flowers, Fruits, Seeds - 3.8
The Garden and Its Friends - 3.7
Gardens Indoors - 3.3
Leaves - none*
Living Things - 2.9
Pebbles and Sea Shells - 3.0
Plant and Animal Partnerships - 3.3
Plant Factories - 3.9
The Plant World - 6.5
Plants Round the Year - 2.8
Seeds and Seed Travels - 3.3
Trees - 4.5
Useful Plants and Animals - 3.2
Watch Them Grow Up - 2.0

Water

Water - 4.1
Water Appears and Disappears - 2.6
Water Supply - 5.8

Animals (including human body)

Adaptation to Environment - 5.1
An Aquarium - 2.7
Animal Travels - 3.8
Animal World - 6.6
Animals and Their Young - 2.1
Animals of the Seashore - 3.8
Animals Round the Year - 3.3
Animals That Live Together - 1.9
Animals We Know - 4.2
Balance in Nature - 6.3
Birds - 3.8
Birds in the Big Woods - 2.1
Birds in Your Back Yard - none*
Domesticated Animals - 6.6
Fishes - 3.8
How Animals Get Food - 3.0
How We Are Built - 6.3
Insect Friends and Enemies - 5.6
The Insect Parade - 3.1
Insect Societies - 6.5
Insects and Their Ways - 4.8
Living Things - 2.9
Plant and Animal Partnerships - 3.3
Pebbles and Sea Shells - 3.0
The Pet Show - 3.2
Reptiles - 3.9
Saving Our Wildlife - 3.3
Six-Legged Neighbors - none*
Spiders - 3.4
Toads and Frogs - 3.2
Useful Plants and Animals - 3.2
Watch Them Grow Up - 2.0
You As a Machine - 5.4

Air

The Air About Us - 3.5
Fire - 4.1
Fire, Friend and Foe - 5.7
Our Ocean of Air - 4.1

*Vocabulary correlated with the Alice and Jerry Basic Readers.

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GRADE EIGHT

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Weather and Climate

Ask the Weatherman - 5.9
Clouds, Rain and Snow - 3.5
Pebbles and Sea Shells - 3.0
Water Appears and Disappears - 2.6
Ways of the Weather - 4.9

Geology

Animals of Yesterday - 4.5
The Earth A Great Storehouse - 4.9
The Earth's Changing Surface - 5.0
Life Through the Ages - 5.2
Pebbles and Sea Shells - 3.0
Soil - 5.1
Stories Read From the Rocks - 3.3

Astronomy

Beyond the Solar System - 5.4
The Earth's Nearest Neighbor - 4.1
How the Sun Helps Us - 2.4
The Sky Above Us - 3.5
The Sun and Its Family - 4.2

GRADE NINE

Introduction to Science

The Scientist and His Tools - 4.5
Superstition or Science - 5.8

Energy from Matter

Matter, Molecules and Atoms - 5.6
Water Appears and Disappears - 2.6
What Things are Made Of - 4.3

Energy, Force and Motion

Doing Work - 3.4
Gravity - 3.2
Machines - 3.2
Rockets and Missiles - 10**

Electrical Energy

Electricity - 4.1
Magnets - 2.7

Common Forms of Wave Energy

Heat - 5.1
Light - 4.5
Sound - 4.7
Thermometers, Heat and Cold - 3.8

Nuclear Structure and Sources of Energy

The Everyday Atom - 8.0

Aerospace

Satellites and Space Travel - 9**

**Reading difficulty determined by Dale-Chall formula.

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MINNEAPOLIS PUBLIC SCHOOLS
Board of Education Library

September 1962

SCIENCE BOOKS AVAILABLE IN PROFESSIONAL SECTION OF LIBRARY

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Association for Supervision and Curriculum Development, N.E.A., 1957
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For discussion purposes only

A PARTIAL LISTING OF PRESENTLY OWNED

SCIENCE MOTION PICTURE FILMS

for
Grade Eight

Correlated to the Major Topics as found in the
Reorganized Science Curriculum

Minneapolis Public Schools
Science Department
6-6-66

For discussion purposes only

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D. Economically valuable ores and minerals	20	Pink
E. Identification of rocks and minerals	22	Pink
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G. Paleontology	28	Pink
IV. The Universe		
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For discussion purposes only

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The annotations for films found on the following pages were obtained in most cases from the Library of Congress cards. Some annotations were secured from other sources, such as the Educational Film Guide and producers' catalogs.

Introduction to Science

Name and Description of Film	Other Grade Placements	Remarks
1. The Calendar: Story of Its Development ** Coronet, 1959; 11 min. Deals with man's efforts from primitive times to keep track of time. The problems which arose through the centuries as man attempted to make an accurate calendar are explored, and the solutions advanced by the Egyptians, Babylonians, and Romans are explained. The resultant Julian and Gregorian calendars are discussed. The film concludes with examples of possible calendars of the future. Both live photography and diagrams are used.	Gr. 8 -	Also listed Astronomy

* Good
** Excellent

I. The Earth

Weather and climate

Name and Description of Film	Other Grade Placements	Remarks
1. Climate and the World We Live In ** Coronet, 1957; 14 min. Shows the determining factors of climate: latitude, altitude, nearness to water, ocean currents, prevailing winds and mountain ranges. Explains the grouping of similar climates into major types and represents regions of the world to show how variations in climate affect human activities.	Gr. 5 - **	
2. Climates of the United States ** C O R, 1962; 11 min., color Surveys the climatic regions of the United States from sub-arctic to tropical savanna, and shows how these regions are determined by such geographic factors as latitude, large bodies of water, ocean currents, altitude, and winds. Emphasizes the influence of climate on homes, clothing, activities and crops.	Gr. 5 - **	
3. Clouds ** U.S. Weather Bureau, 1939; 11 min., black & white Shows various types of clouds; explains how high and low pressure areas move across the country and how to forecast weather from the study of clouds.		

* Good
** Excellent

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Eyes in Outer Space ** Walt Disney, 1959; 26 min., color Describes the work of weather stations today in forecasting weather and possible use in the future of satellites and rockets to control weather and avert destructive storms and hurricanes.	Gr. 5 - **	
5. The Great Winds: Distribution of Pressure ** United; 1950; 10 min. Reviews the principles of circulation that affect distribution of pressure and winds. Through animated diagrams illustrates isobars and winds in areas of Africa and South America to show mounting changes in pressure and corresponding wind belts and pressure and wind belts in southeastern Asia and northern Australia to show movements of monsoon winds.		
6. The Great Winds: General Circulation ** United, 1950; 10 min. Through animated diagrams describes the principal pressure areas on the earth in relation to the overhead noonday sun--the equator, poles, subtropical regions and the belts between the poles and subtropics. Explains that the flow of air from high to low pressure areas establishes the general circulation. A model globe is rotated to show deflection of winds and the paths of trade winds and westerlies.		

* Good
** Excellent

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Ground Water ** EBF, 1935; 11 min., black & white Portrays various evidences, movements and work of ground water. Demonstrates evidences in wells, seepages, springs and geysers. Illustrates through animated drawings the water table, the Great Plains artesian system and the formation of geysers and caverns. Depicts petrified trees, fossils, geode crystals and iron ore deposits as supporting evidence that ground water may deposit, as well as carry away, minerals.		
8. How Weather is Forecast ** Coronet, 1953; 11 min. Shows the operation of a weather observation station and a weather forecasting station; describes the instruments used in weather forecasting and their functions; explains the importance of forecasting to various occupational groups and to the inhabitants of flood areas. Animated sequences are used to show the charting of a weather map and to explain the symbols used.	Gr. 3 - * Gr. 5 - **	Difficult
9. The Inconstant Air ** McGraw-Hill, 1961; 27 min., color To stimulate interest in science and geophysics by providing a broader understanding of present day research into forces affecting weather and climatic changes.		

* Good
** Excellent

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. Origins of Weather ** EBF, 1962; 13 min., color Presents the concept that the sun is the source of all weather and life on earth. Shows by animation how the earth's envelope of air serves as insulation against extremes of temperature. Illustrates how currents and counter-currents interact to keep weather in constant change. Explains how equatorial regions reflect less heat than they receive and polar regions are able to reflect more than they receive.		
11. Our Weather ** EBF, 1955; 11 min., black & white Animation and microphotography are used in explaining why weather changes, how meteorologists predict changes, and how weather affects everyday activities. Discusses the air mass theory and the formation of dew, frost and snow. Includes visits to a weather observation station where the purpose of various instruments is explained, and to a forecasting office where weather maps are plotted from data received from observation stations.	Gr. 5 - *	
12. A Storm Called Maria Walt Disney, 1962; 42 min., black & white Dramatizes the problems created in transportation, communication, and safety when a severe snow storm strikes in the Sierras. Traces the origin of the storm to a Pacific coastal rainstorm near San Francisco. Illustrates how breakdowns occur in road and rail transportation and telephone communications. Pictures the repair and rescue operations of road crews, using snow plows and tow trucks; railroad plows; telephone linemen; and highway patrolmen.	Gr. 8 - Gr. 5 -	No eval. yet No eval. yet

* Good
** Excellent

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
13. A Story of a Storm ** Coronet, 1950; 11 min. Shows the various conditions which cause a rainstorm to develop. Covers the names of clouds, knowledge of pressure areas, fronts, and meteorological information. Traces the results of a single storm.	Gr. 5 - **	
14. Unchained Goddess ** Bell Telephone, 1960; 60 min., color This Bell System science picture deals with the story, in its many facets, of what scientists today know about what makes weather. Dr. Frank Baxter and Richard Carlson are again the stars in this Frank Capra production. Animation, cartoon characters, stills from scientific pictures and live photography are used. The Weather Goddess "Meteora" is featured in this film.	Gr. 5 - *	
15. Up in the Air: Exploring Our Atmosphere ** Grover Jennings Prod., 1961; 12 min., color Air movements; what is in the air; what fog and clouds are; how they form; what happens to them; how cloud changes show air movements; how air movements shape clouds; what air looks like from miles above the earth...all are shown in actual live-action photography; developing simply and easily basic concepts essential to understanding air and weather.	Gr. 5 - **	

* Good
** Excellent

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
16. Water in the Weather ** Academy, 1960; 17 min., color What makes the weather? Heat from the sun, the earth's atmosphere, land areas and water areas all work together as weather makers. The earth's atmosphere is a protective layer which filters out harmful rays from the sun. The clouds drop their moisture as rain, hail or snow. This is the endless cycle of "Water in the Weather".	Gr. 5 - **	
17. What Makes Clouds? ** EBF, 1965; 19 min., color Presents a close look at fog and clouds. Shows that clouds are formed by droplets of water. Explains where this water comes from. Discusses evaporation and transpiration as sources of invisible water vapor. Shows laboratory experiments with condensation. Describes how condensation occurs in nature. Shows the differences between clouds and rain.		
18. What Makes the Wind Blow? ** EBF, 1965, 16 min., color Presents a step-by-step search for the cause of a typical on-shore breeze. Shows possible explanations, trying them in the laboratory and then double-checking them in nature. Explains that pressure differences are found to be associated with air movement. Concludes with a question about the origin of a particular wind in California.		

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Eight
(Addendum)

Additions to
Page 9

I. The Earth

Weather and climate

Name and Description of Film	Other Grade Placements	Remarks
Great Weather Mystery ** MGH; 1961; 27 min., b/w Presents Walter Kronkite, who explores the question of weather control. Shows how storm damage can be minimized by early warnings from forecasting units. Describes the work of the U. S. Weather Bureau's National meteorological Center, weather balloons, satellites, planes such as the U2 and F106. Interviews three weather experts about the methods used for weather control, future possibilities, and the political and social problems involved.		

* Good
** Excellent
5-9-67

Weather and climate (continued)

Name and Description of Film	Other Grade Placements	Remarks
19. Why Seasons Change ** EBF, 1960; 11 min., black & white Shows why seasons change, making use of animated drawings to show why the tilt of the earth gives us short days in winter and long ones in summer. Also explains why it is hot in summer and cold in winter, and why the seasons in the Northern and Southern Hemispheres are always opposite. Follows also the orbit of the earth through a complete year.	Gr. 8 - Gr. 5 - *	Also listed Astronomy
20. Winds and Their Causes ** Coronet, 1948; 11 min. When his gasoline-powered model airplane crashes over a bare field, a young boy becomes interested in winds and obtains information from personal observation, from books, and from an aviator. Explains thermals, cumulus clouds, thunderstorms, the great winds of the earth, on- and off-shore breezes, and the easterlies and westerlies.	Gr. 5 - **	

* Good
** Excellent

I. The Earth

Geology

A. Types of rocks

Name and Description of Film	Other Grade Placements	Remarks
1. Geological History of the Grand Canyon **		
B A R, 1962; 11 min., color		
Explains that the sedimentary rock layers of the Grand Canyon country represent the five eras of geologic history. Shows that the Grand Canyon itself contains rock layers from the three oldest eras. The kind of rock, patterns of deposition and fossils of each layer record the story of past events. Shows that Bryce Canyon reveals the lakes and streams of the 5th era, which is still in progress. Uses animation and live action to indicate the successive rock layers and to interpret them in terms of the ancient landscapes which they represent.		
2. Rocks That Form on the Earth's Surface **		
EBF, 1964; 16 min., color		
Presents an examination of sedimentary rocks. Describes where sedimentary rocks come from, what they are made of, how they are formed. Shows some of the ways sediments are produced, transported, accumulated and hardened into rock.		

* Good
** Excellent

I. The Earth

Geology

B. Changes of the earth's surface

Name and Description of Film	Other Grade Placements	Remarks
1. Birth and Death of Mountains **	Gr. 4 - **	
Film Assoc. of Calif., 1961; 12 min., color		
Mountains seem permanent and unchanging. But ice, wind, and water constantly wear them down. At the same time, new mountains are being created, destroyed and created in a continuing cycle of change.		
2. Birth of the Soil **		
EBF, 1948; 10 min., color		
Explains how nature produces top soil from the basic raw materials of rock, water, air and sunlight. Emphasizes the necessity for an organized conservation program to save our natural resources. Includes animated drawings.		
3. Earthquakes and Volcanoes **	Gr. 4 - **	
Film Assoc. of Calif., 1957; 13 min.		
Presentation of causes of earthquakes and volcanoes, and the relationship between them. Fire and gases from inner earth boiled and erupted millions of years ago; probable cause of earthquakes and volcanoes is the aftermath of cooling. Drawings of inner composition of earth is shown. Face of earth has been altered by volcanoes in the past. Most volcanoes are located in mountainous areas of American and Pacific islands.		

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Erosion - Leveling the Land ** EBF, 1965; 14 min., color Investigates the processes of weathering, erosion, and deposition of rock materials. Shows that the constant movement of these materials from high places toward the seas levels the land. Points up some questions about why the surface of the earth has not been leveled completely.	Gr. 4 -	No eval. yet
5. Eruption of Kilauea ** U.S. Geological Survey, 1961; 27½ min., color Shows the eruption of Kilauea Volcano on the island of Hawaii from its inception in November 1959 in a small pit crater, the violent eruption after a period of comparative calm causing the evacuation of a town and the destruction of 2500 acres of land is viewed.		
6. Evidence For The Ice Age ** EBF, 1965; 19 min., color Presents contrasting features of today's landscapes. Establishes that these features could not result from conditions and processes that now surround them. Explores such anomalies as glacial moraine deposits, polished and striated rock, stray boulders, abandoned drainage channels. Compares the anomalies with the work of modern glaciers.		

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Geological Work of Ice ** EBF, 1935; 11 min., black & white Explains how ice, through geologic ages, has been a powerful factor in sculpturing the face of the earth. Reveals the tremendous effect of ice upon soil and rock as the ice constantly expands, contracts, and moves. Illustrates how glaciers form, move, and alter surrounding terrain features. Animated drawings explain the Pleistocene glaciation period.	Gr. 4 - **	A little adv.
8. Geysers and Hot Springs ** Arthur Barr Prod., 1951; 11 min. Discusses hydrothermal activity as related to volcanism; explains the eruptive action of geysers; shows various types and special features of geysers and hot springs in Yellowstone National Park.	Gr. 4 - **	
9. Glaciers ** Northern, 1959; 14 min., color Tells in detail how glaciers are formed, and shows glaciers from Mt. Ranier, Washington, to the mighty glaciers of Alaska--as well as some glacier scenes of ice sheets in Antarctica and Greenland. Diagrams and animated maps show effect of glacier action and extent of ice during ice ages of the past.	Gr. 4 - **	

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
10. The Great Lakes--How They Were Formed ** EBF, 1951; 11 min., color Through animated drawings and live action photography depicts the work of glaciers in forming the Great Lakes thousands of years ago. Defines present day drainage of the Lakes and the physical characteristics of Niagara Falls. Illustrates topographical changes which occur in the region around the Falls and the Lakes.	Gr. 4 - **	
11. The Hidden Earth ** McGraw-Hill, 1961; 27 min., color Study of Seismology, the study of earthquakes and attendant phenomena.	Gr. 8 -	Difficult
12. The Interior of the Earth ** McGraw-Hill, 1963; 14 min., color This film illustrates that knowledge about areas man cannot reach directly can be acquired by instruments, in this case the seismograph. The first part of the film shows the cause of earthquakes and how they are detected by a seismograph. The second part demonstrates why seismic waves are transmitted through the mantle and core at different speeds due to differences of density. Why there is a shadow zone is illustrated by a light beam passing through two liquids of different densities. This suggests that the outer core has the characteristics of a liquid. Further demonstrations give evidence of a possible inner core with characteristics of a solid.		

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
13. Land and Waters of Our Earth ** Coronet, 1957; 11 min. During a family picnic in a scenic area, a young boy observes hills, mountains, valleys, rivers, and other geographical features, and by studying a pictorial geography book, learns about different land and water formations on the earth's surface.	Gr. 4 - *	
14. Mountain Building ** EBF, 1935; 11 min., black & white Explains diastrophism as one of two factors opposing gradation. Shows alternating types of earth strata as evidence that crustal movements have been both upward and downward. Explains faults, anticlines, synclines, geosynclines and unconformities. Through animated drawings illustrates the probable formation of the Lewis overthrust. Explains earthquake zones, and refers to geologic problems in mining and structural engineering.		
15. Our Soil Resources: Formation and Conservation ** EBF, 1947; 11 min., black & white Explains graphically how soil is formed by the physical and mineral disintegration of rock and by the decomposition of plant and animal matter. Points out the world's four soil groups and defines the geographic limits of each in the United States. Describes how man, through poor farming methods, has depleted the soil, and explains techniques for replacing fertility losses and curbing erosion.		

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
16. Project Mohole ** Educ. Testing Serv., 1960; 19 min., color Explains that the earth's crust is a relatively thin skin of rock which varies in thickness, that beneath this is the mantle which composes more than 80% of the earth's mass and that the boundary between the crust and mantle is called the Moho after the Yugoslav scientist, Mohorovicic, who discovered it. Points out that no one knows much about the mysterious Moho and no one knows for certain about the mantle. Presents a report on Project Mohole's first oceanographic survey in search of a possible drilling site 200 miles north of Puerto Rico. Most of the film was shot aboard the VEMA, an oceanographic research vessel operated by Columbia University's Lamont Geological Observatory.	Gr. 8 -	Also listed Oceanography
17. Secrets of the Ice ** McGraw-Hill, 1961; 27 min., color Explains modern science of glaciology and also a study of the ice found on the earth.		
18. Seeds of Destruction ** EBF, 1948; 10 min., color Recalls the wealth of America's original resources and contrasts this with the tragic waste from devastating forest fires, floods, erosion, and overworked land. Shows how Federal, state and private conservation agencies cooperate in preventing the depletion of natural resources and in preserving the land. Includes animated drawings.	Gr. 4 - *	

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
19. Treasurers of the Earth ** Churchill-Wexler, 1958; 11 min. Uses animation to depict the changes in the earth's crust, and the formation of mineral deposits by natural forces. Illustrates the formation of copper, iron, tin, gold, salt, oil and coal deposits. Shows the formation of a volcano and the reasons why we mine our mineral resources in certain areas.	Gr. 4 - **	For adv. group
20. What's Inside the Earth Film Assoc. of Calif., 1959; 14 min., color The film explores the interior of the earth, indicating and illustrating the methods men use to determine the earth's structure. The film provides an exciting and interest-provoking introduction to the earth sciences.	Gr. 8 - Gr. 4 -	No eval. yet No eval. yet
21. Why Do We Still Have Mountains? ** EBF, 1964; 20 min., color Presents the seeming paradox that erosion should long ago have carried all the land above sea level into the oceans. Explores several of the ways that mountains are formed. Stresses that although mountains are slowly and constantly being washed out to sea, they are being built up faster than they can be cut down.		

* Good
** Excellent

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
22. World at Your Feet ** Int'l Film Bur., 1953; 22 min., color The soil is shown as a veritable thriving community in miniature, populated by living things of the animal, plant and insect worlds, some draining the soil of its usefulness, others contributing to its productiveness. Deals extensively with soil substance, analyzing different types of soil structure and their resistance to varying natural conditions. Suggestions are made as to how man can make his own contributions to the good of the earth.	Gr. 7 - ** Gr. 10 - **	
23. Work of Rivers ** EBF, 1935; 11 min., black & white Portrays running water as the most powerful of all forces tending to alter the earth's surface. Describes the water cycle, and through stream table demonstrations, animated drawings and natural photography, explains the growth of rivers, erosion cycle, rejuvenation, and deposition. Illustrates the formation of ox-bows, sand bars, and deltas. Shows examples of valleys, meanders, water gaps, and alluvial fans.	Gr. 4 - **	
24. Work of the Atmosphere ** EBF, 1935; 11 min., black & white Characterizes atmosphere as one of the most effective agents of earth gradation. Demonstrates mechanical disintegration caused by temperature changes, freezing water, wind erosion, and wind abrasion. Shows chemical disintegration of rocks caused by oxidation, hydration, and carbonation. Describes atmosphere in its roles of transportation and deposition by depicting sand and dust storms, dunes and dust deposits.		

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Eight
(Addendum)

Additions to
Page 19

I. The Earth

Geology

B. Changes of the earth's surface

Name and Description of Film	Other Grade Placements	Remarks
FOCUS STORY: Camp Century - a city under the ice. **		

HMN, 1964; black & white

Presents Camp Century, 800 miles from the North Pole and 40 feet below the surface of the snow. Shows excavation of the trenches, construction of the buildings in -20 temperature. Pictures placing of atomic fuel bars in the core of the atomic oven, which powers the nuclear reactor. Shows the "biggest deep freeze" in the world, spacious kitchens, medical dispensary, and quarters of the men. Illustrates how soldiers and civilians live exactly as they do at home in the U. S. while they carry on their polar research projects in the frozen city.

PREHISTORIC TIMES: World Before Man **

Coronet; 10 min., black & white

Describes the five geological periods of prehistoric times: Archeozoic, Proterozoic, Paleozic, Mesozoic, and Cenozoic. Includes the gradual formation of the earth's crust, continents, and seas; and traces the evolution of life from simple forms, through the period of fish and other vertebrates, and the age of reptiles and land animals, to mammals and man. Shows pictures of actual fossils, examples of land forms, dioramas, paintings and models.

* Good
** Excellent
5/22/67

B. Changes in the earth's surface (continued)

Name and Description of Film	Other Grade Placements	Remarks
25. Yosemite: Its Geology, History, and Beauty B A I, 1965; 18 min., color Presents a study of Yosemite Park. Shows many differest rock formations that depict how the area was formed from glaciers. Describes the natural beauty of the park. Discusses respect for our parks and ways we can help keep them free from litter.	Gr. 8 - Gr. 4 -	No eval. yet No eval. yet
26. Yours is the Land ** EBF, 1950; 20 min., color Shows the role of top soil, water, plants, forests and animal life in the conservation of natural resources. Exposes the results of man's practice of taking too much from the earth in too short a time. Emphasizes the need for a system of orderly management of our natural resources.	Gr. 7 - * Gr. 10 - **	

* Good
** Excellent

I. The Earth

Geology

D. Economically valuable ores and minerals

Name and Description of Film	Other Grade Placements	Remarks
1. Copper Mining ** Pat Dowling, 1960; 14 min., color Explains how copper is mined and processed. Shows a huge open-pit mine in the West where ore is mined by the use of heavy equipment and transported to a mill. Shows the processes of milling and smelting until blister bars containing 99% pure copper are obtained. Emphasizes the vast amount of raw material that must be mined to extract the valuable remaining metal.		
2. Drilling for Oil ** Pat Dowling, 1957; 22 min., color The step-by-step operations of drilling an oil well, in live photography and animation, from the initial exploration of the field to final drilling process. Brief explanation of drilling techniques under varying conditions. Work of various members of crew is explained: crane operators, drillers, derrick men, cat-head operators, and others.	Gr. 4 - *	
3. Iron Ore Mining ** Academy, 1950; 13 min. Pictures the operation of a typical large open pit iron mine in the Mesabi Range of Northern Minnesota. Shows the transportation methods necessary to move mass quantities of ore from the mines by rail car to the loading docks at Duluth, the loading of the ore boat, and the ore boat leaving the harbor on its way to the steel mills of Chicago, Pittsburgh and Cleveland.	Gr. 4 - **	

* Good
** Excellent

D. Economically valuable ores and minerals (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Making Glass ** EBF, 1948; 11 min., black & white Describes how three ingredients of glass--limestone, sand, and soda ash--are obtained. Through close-up shots presents a simple laboratory demonstration of basic glass-making techniques. Portrays the step-by-step large scale manufacture of glass in a plant. Shows the technique of fitting glass panes into window frames.	Gr. 4 - **	

* Good
** Excellent

I. The Earth

Geology

E. Identification of rocks and minerals

Name and Description of Film	Other Grade Placements	Remarks
1. Rocks and Gems ** AV-ED Films, 1963; 11 min., color This film explains graphically, with animation, the basic principles of the formation of rocks and gems. It describes how to recognize the different types by color, luster, weight, hardness and crystal formations. It shows where to find gems and the many ways in which we use rocks and minerals today.		

* Good
** Excellent

I. The Earth

Geology

F. Oceanography

Name and Description of Film	Other Grade Placements	Remarks
1. Animal Life at Low Tide Pat Dowling, 1955; 11 min., color A boy and girl visit the seashore and, at a tide-pool, find and study many salt-water animals and their means of locomotion, protection and getting food. Included are starfish, tube-building sea worms, sea anemone, limpet, sea urchin, snails and the molting of hermit crabs..	Gr. 8 - Gr. 4 - ** Gr. 7 - **	No eval. yet
2. Beach - A River of Sand EBF, 1965; 20 min., color Discusses the oceanographic wonder -- where does sand come from? Where does sand go? Analyzes currents produced by waves. Calculates accumulation and depletion of sand produced by jetties. Shows that most of the movement of sand is along the shore; thus the beach is a moving river of sand existing between the land on one side and the breaking waves on the other.	Gr. 8 - Gr. 4 -	No eval. yet No eval. yet
3. Challenge of the Oceans McGraw-Hill, 1961; 27 min., color Explains scope and objectives of present day oceanographic exploration.	Gr. 8 - Gr. 7 - **	No eval. yet

* Good
** Excellent

F. Oceanography (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Exploring the Ocean Churchill-Wexler, 1960; 11 min., color Pictures the ocean's floor, slopes and continental shelves. Investigates plants and animals, and explains how all life in the ocean depends on the tiniest forms of plant life. Describes the ocean's vast storehouse of minerals and describes the part played by the water cycle in depositing these minerals. Animation.	Gr. 8 - Gr. 4 - **	No eval. yet
5. Life in the Ocean Film Assoc. of Calif., 1963; 16 min., color This film presents an overview of the plants and animals of the sea. The relationships of marine forms to each other, to their environment, and to similar living things found on land is emphasized. Plants and animals of shore, shallow water, and ocean depths are examined in some detail.	Gr. 8 - Gr. 4 - ** Gr. 7 - **	No eval. yet
6. Marine Life EBF, 1953; 11 min., color Underwater photography is used in showing how big fish hunt for victims while the small fish seek safety. Includes scenes of a porpoise, a sea turtle, an angel fish, a Spanish hogfish, a sawfish, an octopus, a green moray, a baracuda, and different species of crabs and sharks. Photographed at the Marine Studios at Marineland, Florida.	Gr. 8 - Gr. 5 - ** Gr. 7 - ** Gr. 10 - **	No eval. yet

* Good
** Excellent

F. Oceanography (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. Mysteries of the Deep Walt Disney, 1961; 24 min., color Presents glimpses of the mysterious life below the surface of the sea. Pictures animals that live at different levels of the sea, especially those animals that live on the rocky reefs at the bottom. Depicts plumed sea slugs being eaten whole by the giant slug, navanax; predatory fish having their scales cleaned by French Angel and Barbershop Shrimp; ballet of the Squirrel Fish at mating time; Grunt's kissing ritual; miracle of birth of the dolphins, sea horse and octopus. Emphasizes the struggle for survival of the creatures that inhabit the reefs.	Gr. 8 - Gr. 4 - Gr. 7 - **	No eval. yet No eval. yet
8. Project Mohole ** Educ. Testing Serv., 1960; 19 min., color Explains that the earth's crust is a relatively thin skin of rock which varies in thickness, that beneath this is the mantle which composes more than 80% of the earth's mass and that the boundary between the crust and mantle is called the Moho after the Yugoslav scientist, Mohorovicic, who discovered it. Points out that no one knows much about the mysterious Moho and no one knows for certain about the mantle. Presents a report on Project Mohole's first oceanographic survey in search of a possible drilling site 200 miles north of Puerto Rico. Most of the film was shot aboard the VEMA, an oceanographic research vessel operated by Columbia University's Lamont Geological Observatory.	Gr. 8 -	Also listed Changes in earth's surface

* Good
** Excellent

F. Oceanography (continued)

Name and Description of Film	Other Grade Placements	Remarks
9. The Restless Sea (Part I and Part II) Bell Telephone Co., 1963; 60 min., color Presents a wide-ranging report on the vast and mysterious "inner space" that covers nearly three quarters of the earth's surface--the sea. Illustrates in animated and filmed sequences the work of oceanographers in searching out the complex and interwoven relationships of nature in the sea. Shows hurricanes and mountainous waves; marine life from microscopic plankton to the largest mammals; movements of tides and currents; composition of sea water; topography of the ocean floor, with its great seamounts, sunken islands and submarine canyons and trenches. The only "character" that appears is a cartooned drop of water, who helps to explain the various phenomena.	Gr. 8 - Gr. 4 - Gr. 7 -	No eval. yet No eval. yet No eval. yet
10. Sea EBF, 1962; 27 min., color Depicts the interrelationships between living things in the sea, their dependence on each other and on the varying conditions of the marine environment. Shows the diversity of free-swimming animals and illustrates basic concepts of marine ecology, such as the evolution of life and the predation and reproduction of marine life.	Gr. 8 -	No eval. yet
11. Tide Pool Life Instructional Films, 1947; 11 min., color Studies some of the more usual species of marine life found near rocky shores and tide pools, including mussels, whelks, sea-anemones, sea-urchins, and abalones.	Gr. 8 - Gr. 5 - ** Gr. 7 - ** Gr. 10 - **	No eval. yet

* Good
** Excellent

F. Oceanography (continued)

Name and Description of Film	Other Grade Placements	Remarks
12. Waves on Water ** EBF, 1965; 15 min., color Explores the manner in which water in a wave moves. Explains how waves are created. Describes wave refraction. Discusses discoveries regarding high-energy waves that are not produced by wind. Presents evidence to prove that seismic sea waves which crossed the Pacific Ocean were directly associated with an underwater earthquake near the Aleutian Islands.		
13. What's Under the Ocean ** Film Assoc. of Calif., 1959; 12 min., color Scientists study the ocean in many ways. Some take cameras to study plants and animals in shallow depths. Some go to the deepest ocean floor in special craft like abathyscaph. Some use instruments on research ships to study bottom materials and to map vast areas of the ocean floor. They have found a long mountain range dividing the Atlantic in two and in the Pacific, thousands of volcanoes and many deep trenches.	Gr. 4 - ** Gr. 7 - **	

* Good
** Excellent

I. The Earth

Geology

G. Paleontology

Name and Description of Film	Other Grade Placements	Remarks
1. Discovery at Hell Creek FRC, 1963; 30 min., color Introduces the methods of vertebrate paleontology. Emphasizes the importance of every fossil discovery as scientists try to piece together the many fragments of the knowledge of the history of life on earth. Shows the dinosaur quarry in the banded rocks of the Hell Creek formation in Northeastern Montana.	Gr. 8 -	No eval. yet
2. Fossils: Clues to Prehistoric Times ** Coronet, 1960; 10 min., color The story of fossils (the traces of ancient animals or plants), where they are found, how they were formed and what they tell us about the development of life on earth is the subject of this study. Museum dioramas, animation and many fossil specimens are used to explain the work of scientists and their findings.	Gr. 4 - ** Gr. 7 - **	

* Good
** Excellent

IV. The Universe

Astronomy

A. History of astronomy

Name and Description of Film	Other Grade Placements	Remarks
1. Planets in Orbit (Laws of Kepler) ** EBF, 1960; 10 min., black & white Traces the history of man's observations and beliefs about the universe. Discusses the three discoveries of Johannes Kepler that revolutionized astronomy. Explains Kepler's three laws. Animated sequences.	Gr. 5 - *	

* Good
** Excellent

IV. The Universe

Astronomy

B. Tools and laboratories used in the study of the universe

Name and Description of Film	Other Grade Placements	Remarks
1. The Astronomer ** Inter. Film Bureau, 1960; 16 min., color Presents a comprehensive picture of the methods and tools used by present-day astronomers; shows construction and functions of telescopes and a solar tower. Explains difference between refractors and reflectors. Stresses the work of the astronomer away from the telescope.		
2. Frontiers in Space ** EBF, 1962; 11 min., color Uses behind-the-scenes views in the Palomar Observatory to show astronomers using optical and radio telescopes to gather information about the universe. Describes how reflecting and refracting telescopes work and shows the world's largest reflecting telescopes in operation. Explains the methods used by astronomers to obtain and analyze data about the stars, including photographs, spectrographs and recordings of signals received from radio telescopes.		
3. Stars and Star Systems ** EBF, 1960; 16 min., black & white Shows an astronomer at work, explaining that with the use of powerful telescopes astronomers have been able to photograph about one and one-half billion stars; describes a radio telescope and balloon as other methods of astronomical observation. Discusses the vastness of the universe and the heavenly bodies of which it is comprised.	Gr. 5 - 4	

* Good
** Excellent

B. Tools and laboratories used in the study of the universe (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. The Story of Palomar **	Gr. 11 - *	

EBF, 1960; 39 min., color

The story of the giant 200 inch telescope on Palomar Mountain, photographed over the period of years during which the giant telescope was planned and designed. Shows the grinding of the huge mirror, the tedious journey of the mirror up the mountainside, and finally the giant instrument in operation. Includes photographs of distant galaxies made through the 200 inch telescope and compares these photographs with others made by earlier and smaller telescopes, showing how man's view of the heavens has been extended by the new Palomar installation. Includes animated sequences which show the principles of optics which are used in reflecting telescopes of all sizes.

5. Charting the Universe With Optical and Radio Telescopes **

EBF, 1963; 13 min., color

Presents the Hale telescope at the Palomar Observatory. Shows how astronomers come from all over the world to use this telescope to analyze starlight, to determine the component elements, distance, speed of travel, age, physical structure, and temperature of the stars. Relates how an astrophysicist or astronomer uses the radio telescope which collects radio signals caused by the radiation of bodies in space. Describes the basic tools, methods and goals of astronomers.

* Good
** Excellent

IV. The Universe

C. Our solar system

The nearest star, the sun

Name and Description of Film	Other Grade Placements	Remarks
1. The Flaming Sky ** McGraw-Hill, 1961; 27 min., color Explanation of present day opinion on the nature of the Aurora and its connection with other natural phenomena in the earth's high atmosphere and the sun.		
2. The Nearest Star ** McGraw-Hill, 1961; 27 min., color To stimulate interest in science in general and geophysics--influence of the sun on man's physical environment.	Gr. 5 - **	
3. Our Mr. Sun ** N.W. Bell Tele., 1960; 60 min., color This Frank Capra produced film, starring Eddie Albert and Dr. Frank Baxter, first describes ways in which ancient man looked to the sun as a god. It continues with more facts which man has discovered about the sun through the centuries. The sun's conona, spots, and the explosions on its face are shown. Thermonuclear reaction, photosynthesis and the solar battery are explained. World's leading scientists contribute information.	Gr. 5 - *	

* Good
** Excellent

C. Our solar system

The nearest star, the sun (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. The Sun's Energy ** Academy Films, 1960; 16 min., color This film explains why the sun's energy is the basis of all life on earth and the source of all types of industrial energy except atomic energy. Green leaves of plants use the sun's energy to manufacture food, which is stored in fruits, seeds, stems and roots. Human beings get much of their energy by eating the seeds, fruits and roots of many different plants. So directly or indirectly plants sustain all animal life and green plants depend on sunlight.	Gr. 5 - ** Gr. 9 - **	

* Good
** Excellent

IV. The Universe

C. Our solar system

The earth as a planet

Name and Description of Film	Other Grade Placements	Remarks
1. Day and Night ** United, 1949; 9 min. The globe is shown revolving about the sun to explain the causes of day and night and why the sun appears to rise and set. Describes the effect of the earth's inclination toward the sun. Through animated diagrams demonstrates the relative position of earth and sun in June, September, December, and March, and the reasons for unequal length of day and night over the earth at different times of the year.	Gr. 5 - **	
2. Earth in Motion * EBF, 1936; 12 min., black & white Portrays the earth as an astronomical body and discusses its relation to the sun and its motion. Presents evidence of the earth's sphericity, its axis rotation, its revolution about the sun, and inclination of its axis. Permits stimulated observation of the earth from the stratosphere, of earth and stars in motion, and of the earth's orbit movement, explaining the causes of night and day and of seasons.		

* Good
** Excellent

m

C. Our solar system

The earth as a planet (continued)

Name and Description of Film	Other Grade Placements	Remarks
3. How We Know the Earth Moves ** Film Assoc. of Calif., 1960; 10 min., color We have been told that the earth spins on its axis and that it travels around the sun. But how do we know these statements are true? This film demonstrates and explains the Foucault Pendulum by which the earth's rotation was first proved. The audience participates in an experiment that illustrates star shift, the method astronomers use to determine the earth's solar orbit.	Gr. 5 - **	
4. Why Seasons Change ** EBF, 1960; 11 min., black & white Shows why seasons change, making use of animated drawings to show why the tilt of the earth gives us short days in winter and long ones in summer. Also explains why it is hot in summer and cold in winter, and why the seasons in the Northern and Southern Hemispheres are always opposite. Follows also the orbit of the earth through a complete year.	Gr. 5 - *	

* Good
** Excellent

IV. The Universe

C. Our solar system

The earth's satellites

Name and Description of Film	Other Grade Placements	Remarks
1. A Trip to the Moon ** EBF, 1957; 16 min. Shows an imaginary rocket as it takes off to the moon and hovers above it, explaining many facts necessary for an understanding of navigation to the moon. Combines animation and model photography to study the moon's surface, and shows in detail the craters and seas, ridges, and mountains that can be seen from the earth.	Gr. 6 - ** Gr. 9 - ** Gr. 11 -	 No eval. yet
2. Eclipse of the Sun * Film Research Assoc., 1961; 17 min., color Shows the importance of and the organization of an expedition to observe an eclipse of the sun in Africa under the most favorable conditions. The film is narrated by Dr. Athelstan Spilhaus, Dean, Institute of Technology, University of Minnesota.		
3. Exploring by Satellite ** C E F, 1960; 28 min., color Uses live action and animation to explain the earth satellite program, to describe the physical laws involved. Discusses the scientific methods used; tells about the data obtained in the Vanguard experiment during the International Geophysical Year.	Gr. 9 - **	

* Good
** Excellent

SCIENCE MOTION PICTURE FILMS - Grade Eight
(Addendum)

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IV. The Universe

C. Our solar system

The earth's satellites

Name and Description of Film	Other Grade Placements	Remarks
Tides of the Ocean ** Academy, 1963; 16 min., color Presents an explanation of ocean tides based on Newton's Laws. Shows how gravity and centrifugal force, caused by the sun and moon, influence the tides. Uses animation to explain why we have two high and two low tides every twenty-four hours and fifty minutes. Explains why tides occur at the time of the full and new moon and why they vary with the seasons. Depicts how many of man's activities must be timed to fit into the eternal rhythm of the tides.	Gr. 5 - **	

* Good
** Excellent
5/23/67

C. Our solar system

The earth's satellites (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Gravity ** Coronet, 1950; 11 min. Through a variety of everyday examples explains the force of gravity. Shows attraction in relation to mass and distance, and the effect of gravity on our solar system. Demonstrates and explains mutual attraction between all bodies.	Gr. 8 - Gr. 5 - ** Gr. 6 - ** Gr. 9 - **	For slow group

* Good
** Excellent

IV. The Universe

C. Our solar system

Movements of the planets, meteors and comets

Name and Description of Film	Other Grade Placements	Remarks
1. Asteroids, Comets and Meteorites *** Film Assoc. of Calif., 1960; 10 min., color Asteroids, comets and meteorites are called the minor members of the solar system. This film shows: 1) how astronomers have learned about these objects traveling around the sun; 2) what each group looks like; and 3) the place of each group in the solar system. The film also illustrates the newest objects in the solar system--man-made or artificial satellites.	Gr. 5 - **	
2. Solar Family ** EBF, 1936; 11 min., black & white Presents an introductory study of the planets, their evolution, motions, sizes and satellites. Describes, through animated drawings the evolution of the solar system according to planetesimal hypothesis, and traces the real and apparent motions of the planets. Reveals and describes the planetoids, Halley's comet, and the movement of the solar system in space.	Gr. 5 - *	

* Good
** Excellent

C. Our solar system

Movements of the planets, meteors and comets (continued)

Name and Description of Film	Other Grade Placements	Remarks
3. The Solar System **	Gr. 8 - Gr. 5 - **	As introd.
Coronet, 1951; 11 min.		
Presents the names of the planets, their relative sizes, and the forces at work in the solar system. Visualizes the immensity of distances between the planets and the sun through an actual scale model of the solar system. Demonstrates the relationship of the planets to each other; their orbits; differences between planets and stars; and gravitational attraction, light, and heat.		

* Good
** Excellent

IV. The Universe

D. Measurement of time

Name and Description of Film	Other Grade Placements	Remarks
1. About Time ** N.W. Bell Tele., 1962; 60 min., color The amazing story of man's struggle to tell time...from the sun dial to the atomic clock. First-hand look into relativity, making calendars and built-in clocks in plants and animals. Presents complex subject of time and its measurement through story of Planet Q, where the concept of time is unknown.	Gr. 11 - **	
2. The Calendar: Story of its Development ** Coronet, 1959; 11 min. Deals with man's efforts from primitive times to keep track of time. The problems which arose through the centuries as man attempted to make an accurate calendar are explored, and the solutions advanced by the Egyptians, Babylonians, and Romans are explained. The resultant Julian and Gregorian calendars are discussed. The film concludes with examples of possible calendars of the future. Both live photography and diagrams are used.	Gr. 8 -	Also listed Intro.
3. Time ** Ind. Univ., 1959; 15 min. Through live photography, models and animation portrays scientific time determination, timekeeping, standard time, zones in the United States, daylight saving time, Greenwich time, and the International Date Line.		

* Good
** Excellent

IV. The Universe

F. Beyond the solar system

Name and Description of Film	Other Grade Placements	Remarks
1. Constellations: Guide to the Night Sky ** Ind. Univ., 1961; 11 min., color This film, as its title implies, offers the student the necessary information to locate the major constellations and to use these to locate other constellations. Examples of galaxies, nebulae and other celestial objects are provided by animation and photographs taken at the Mount Wilson and Mount Palomar Observatories.	Gr. 5 - **	
2. Exploring the Night Sky * EBF, 1956; 10 min., black & white Describes constellations and how they got their names, nebulae and other star phenomena, the setting and rising of stars, and how the stars affected the making of the calendar. Includes animation and special cinema techniques.	Gr. 5 - *	
3. The Infinite Universe ** Almanac Films, 1951; 10 min., black & white Explains the concepts of astronomical time, space, speed, and size, and shows the relationship of various stars and galaxies in the universe.		

* Good
** Excellent

F. Beyond the solar system (continued)

Name and Description of Film	Other Grade Placements	Remarks
4. Mars and Beyond * Walt Disney, 1958; 30 min., color Discusses the temperature and atmosphere on the planets, and the conditions necessary to sustain life. Explains man's earliest concepts of the planets, particularly Mars. Pictures the possible surface of Mars and the ways in which plant and animal life may have adapted to conditions there. Describes an imaginary flight to Mars in an atom-powered space ship.	Gr. 5 - ** Gr. 6 - ** Gr. 9 - **	
5. The Realm of the Galaxies ** Educ. Testing Serv., 1960; 19 min., color Dr. Allan R. Sandage, professor of astronomy at the California Institute of Technology, explores the far reaches of space, using the gigantic 200-inch telescope on Palomar Mountain. Traces the study to determine the distance to the galaxy M33 in the constellation of Triangulum in order to redetermine the size, shape and age of the entire universe. Shows the photographic and photometric observations made over a period of two nights.		
6. Universe ** Nat'l. Film Board, 1961; 30 min., black & white Simple presentation of structure of universe. Impression of immensity in time, space, number and variety conveyed by discussion buttressed by astronomical photographs. Describes members of solar system and its position in Milky Way. Pictures work of an astronomer.	Gr. 5 - **	

* Good
** Excellent

F. Beyond the solar system (continued)

Name and Description of Film	Other Grade Placements	Remarks
7. What Is Space? ** EBF, 1961; 10 min., color Establishes a simple concept of space and answers various questions concerning space. Broadens the concept of space through the use of demonstrations and explanations of outer space and the amount of space (light years) between our planet and others. Points out that as yet no end to space is known.	Gr. 5 - **	

* Good
** Excellent

BIB. FILMSTRIPS

For discussion purposes only

SCIENCE FILMSTRIPS
(35 mm.)

for
Grade Eight

Correlated to the Major Topics and/or Units
as found in the
Reorganized Science Curriculum

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Grade Eight

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The annotations for filmstrips found on the following pages were obtained from sources such as the Wilson's Filmstrip Guide, producers' catalogs, and the Library of Congress cards.

Introduction to Science

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Scientists at Work * American Gas Association Educational Service Bureau, 46 fr., b/w $ Designed to show an image of the scientist. His contributions and procedures are stressed. Thinking, designing experiments & recording data are emphasized. Activities such as life of keeping up-to-date & reporting his work are discussed. Natural gas and science occupations are related at the close of the strip.	Gr. 4 ** Gr. 6 * Gr. 7 *	

* Good
** Excellent

I. The Earth

Weather and climate

Name and Description of Filmstrip | Other Grade Placements | Remarks

1. Big Winds - The Destroyers **

   McGraw-Hill Book Co., 1959, 42 fr., color
   (General Science series, Set No. 4, 6 f.s.)
   $6.75 each, $36.50 set

   Shows the causes of winds and compares high pressure centers with low pressure centers. Traces the pathways of hurricanes; describes warning systems used to protect people against big winds; compares tornadoes with hurricanes; and depicts the damage caused by tornadoes and hurricanes.

2. Weather and Jet Stream **

   McGraw-Hill Book Co., Inc., 37 fr., color
   (General Physical Sciences series, 6 f.s.)
   $8.50 each, $45.00 set, 1959

   This filmstrip emphasizes the modern theory of weather. It deals with the influences of air masses on weather conditions, and the effect of the jet stream on the movement of polar and tropical air masses. The changes in weather are described as occurring at the fronts of moving air masses. The kinds of weather changes that accompany warm fronts and cold fronts are presented.

3. What Is Weather **

   Benefic Press, 1961; 39 fr., color
   (What Is It series, 6 f.s.) $

   Presents basic facts about weather. For elementary grades.

* Good
** Excellent

I. The Earth

Geology

A. Types of rocks

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Metamorphic Rocks ** Ward's Natural Science Establishment, Inc., 1962; 55 fr., color (Materials of the Earth's Crust, 6 f.s.), $40.00 a set The agents of metamorphism are discussed and the results of their work illustrated by specimens. The metamorphosed rocks and their parent forms are compared and the forces causing the change discussed. Pressure, heat, cementation, superheated water are the agents of metamorphosis illustrated.		Listed under I - E
2. The Minerals ** Ward's Natural Science Establishment, Inc. 1962; 59 fr., color (Materials of the Earth's Crust, 6 f.s.), $40.00 set Examples of many common minerals are given. Atomic crystaline models are used to show how atomic structure and external shape are related. The processes of crystal formation are shown. The combination of minerals to form rocks is illustrated by specimens.		Listed under I - E
3. The Rocks ** Ward's Natural Science Establishment, Inc. 1962;, 61 fr., color, (Materials of the Earth's Crust, 6 f.s.), $40.00 a set The igneous, sedimentary and metamorphic rocks are shown and the nature of their formation is depicted in photos and art drawings. The formation of fossils is shown in the section on sedimentary rocks. The limestone-marble type of metamorphosis is shown with specimens.		Listed under I - E

* Good
** Excellent

I. The Earth - A (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. Sedimentary Rocks ** Ward's Natural Science Establishment, Inc. 1962, 62 fr., color, (Materials of the Earth's Crust, 6 f.s.), $40.00 a set The processes causing the formation of rock fragments are reviewed. Specimens illustrate the formation of the common sedimentary rocks. Chemical sedimentation forming limestone is illustrated. Cave deposition, formation by evaporation, and the organic origin of coal are shown		Listed under I - E

* Good
** Excellent

I. The Earth

Geology

B. Changes of the earth's surface

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Changes in the Earth's Crust ** McGraw-Hill Book Co., Inc., 37 fr., color (General Physical Science Series, 6 f.s.) Set-$45.00; each-$8.50 This filmstrip describes the formation of the earth from a molten mass of material; the changes that took place during the cooling process; and some of the internal and external forces that affected the earth's surface. The relationship between the formation of the earth and sun and the other planets is indicated. Agents of weathering and erosion changed the surface. The filmstrip indicates the crust of the earth is still changing as a result of internal and external forces.		
2. The Earth as a Planet * Films for Education, 1958; 60 fr., color (The Story of the Universe I--The Earth and its Moons Series, 6 f.s.), $7.50 each Filmstrip takes up the earth as a planet and as a home for men--its composition, structure, atmosphere and seasons. The law of gravity is introduced by inquiring about the mass of the earth.		Few frames good Listed under IV -C
3. Glaciers ** Ward's Natural Science Establishment, Inc., 1963, 69 fr., color, (Geomorphology, 6 f.s.) $40.00-set The conditions causing glacial formation are discussed. Valley glaciers and continental glaciers are shown. The characteristic formations cirques, lateral moraines, medial moraines, terminal moraines, striated, sub-strata, hanging valley, drumlins, eskers, are shown and their formation discussed.		

* Good
** Excellent

I. The Earth - B (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

4. Lakes and Oceans **

Ward's Natural Science Establishment, Inc., 1963, 61 fr., (Geomorphology, 6 f.s.), color $40.00-set

The many types of lakes are discussed and the processes by which they were formed - crater lakes, glacial lakes, mountain ringed lakes, dammed stream lakes. The formation of peat bog, swamps, salt lakes and alkaline lakes is discussed. Ocean deposition and erosion are illustrated. Wave action, sand bars, spits, and lagoons are also shown. The fiords, coral reefs, and fossiliferous sandstone is discussed and illustrated.

5. Mountains **

Ward's Natural Science Establishment, Inc., 1963 57 fr., color, (Geomorphology, 6 f.s.). $40.00-set

Discusses mountain formations in terms of mountain building forces and the erosion of new formation. Volcanic mountains and faulted mountains are shown. The forces causing these are discussed. Synclines and anticlines are diagramed and actual photographs shown.

6. Story of Fossils *

McGraw-Hill Book Co., 1957, 40 fr., color (General Science Series, Set No. 1) Set-$42.00, each-$7.50

Presents a view of the geologic eras during which fossils formed; discusses the principles of fossil formation; shows typical animal life present in different stages of geologic history; presents examples of plant life found in prehistoric rocks; and traces the evolution of a typical mammal through the geologic eras.

* Good
** Excellent

I. The Earth - B (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks

7. Streams and Rivers **

Ward's Natural Science Establishment, Inc.
1963, 60 fr., color, (Geomorphology, 6 f.s.)
Set-$40.00

Introduction deals with running water in general. Sources of ground water, artesian spring, cave formation, stalactites, stalagmites, sinks, and karst formations.
Rivers: The evolution of a river from stream to orbow stage. Patterns of deposition - delta, alluvial fans are shown.
Streams: Dynamics of gradient, load and sediment are discussed. The formation of potholes, sand bars, and terraces is shown.

8. Volcanism **

Ward's Natural Science Establishment, Inc., 1963, 66 fr., color, (Geomorphology, 6 f.s.), set-$40.00

Vertical cross section of a volcano shows magma and fractured rock strata. The Shield Volcanoes of the Hawaiian Islands are shown, types of lava and cinder cones are shown. The dikes, sills, plugs, and laccolith, batholith formations illustrated. Hot springs and geysers are discussed.

9. Weathering and Erosion **

Ward's Natural Science Establishment, Inc., 1963
67 fr., color, (Geomorphology, 6 f.s.), set-$40.00

The agents of weathering - chemical reactions, dissolving power of water, mechanical power of abrasion on rocks, are discussed and examples shown. Exfoliation, the work of freezing water, and the role of plants (both lichens and root plants) are shown. Erosion is defined as abrasim and the removal of the products of weathering. The agents of erosion - wind, running water, glaciers, gravity, and man - are discussed and examples of each type are shown.

* Good
** Excellent

I. The Earth

Geology

C. Chemicals important in soils

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Conserving Our Soil and Water * McGraw-Hill Book Co., 1956, 41 fr., color (General Science Series, Set No. 1, 7 f.s.) Set-$42.50, each-$6.75 Discusses the principles of soil and water conservation, showing the close relationship between them. Describes techniques used to prevent soil erosion, and points out the relationship of floods to soil and water conservation.		
2. How Soil is Formed * EBF, 1950, 71 fr., b/w., $3.00 each (Soil Conservation Series, 8 f.s.) Describes nature's process in manufacturing soil; portrays the initial break-up of rocks by various agents; explains the rote of organic matter in soil formation.		

* Good
** Excellent

I. The Earth

Geology

D. Economically valuable ores and minerals

Name and Description of Filmstrip	Other Grade Placements	Remarks

1. Changing Ores to Metals **

McGraw-Hill Book Co., 1955, 47 fr., color,
(General Science Series, Set No. 2, 7 f.s.)
Set-$42.50, each-$6.75

The filmstrip opens with pictures that show that most ores are compounds. Iron oxide, the most common ore of iron is then depicted. Students observe the chemical reaction and process used to change iron oxide to the metal in blast furnaces. They also are shown how oxygen is used to help smelt low-grade iron ores. The pictures next illustrate the ores of copper and the steps used to smelt copper and refine it. Students then see how lead sulphide is converted into lead, with silver as a by-product. A study of zinc follows, in which zinc sulphide and zinc silicate are converted into the metal. Next, students observe the extraction of mercury from cinnabar and the extraction of tungsten from wolframite. The succeeding pictures illustrate the ores for uranium, and their reduction to uranium oxide. The filmstrip closes with a demonstration of the electrolysis of bauxite to produce aluminum.

2. Wealth from Mother Earth **

McGraw-Hill Book Co., 1959, 42 fr., color,
(General Science Series, Set No. 4, 6 f.s.)
Set-$36.50, each-$6.75

Shows the occurrence of natural resources in the world and the resources that are found on a large scale in the United States. Shows examples of the important products produced from natural resources; points out the need for conserving raw materials by care and salvage for reuse.

* Good
** Excellent

I. The Earth

Geology

E. Identification of rocks and minerals

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Identification of Minerals ** Ward's Natural Science Establishment, Inc., 1962, 66 fr., color, (Materials of the Earth's Crust, 6 f.s.), Set-$40.00 Moh's scale of hardness is shown. Cleavage and fracture are discussed and ample examples of each type are shown. Color and streak color, light qualities (Transparent, etc.) luster, tenacity and other classic tests for minerals are shown with many specimens. More modern tests, autoradiography, and fluorescence are also depicted.		
2. Metamorphic Rocks ** Ward's Natural Science Establishment, Inc., 1962, 55 fr., (Materials of the Earth's Crust, 6 f.s.) color, Set-$40.00 The agents of metamorphism are discussed and the results of their work illustrated by specimens The metamorphosed rocks and their parent forms are compared and the forces causing the change discussed. Pressure, heat, cementation, superheated water are the agents of metamorphosis illustrated.		Listed under I - A
3. The Rocks ** Ward's Natural Science Establishment, Inc., 1962, 61 fr., color, (Materials of the Earth's Crust, 6 f.s.), Set-$40.00 The igneous, sedimentary and metamorphic rocks are shown and the nature of their formation is depicted in photos and art drawings. The formation of fossils is shown in the section on sedimentary rocks. The limestone-marble type of metamorphosis is shown with specimens.		Listed under I - A

* Good
** Excellent

I. The Earth - E (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. The Minerals ** Ward's Natural Science Establishment, Inc., 1962, 59 fr., color, (Materials of the Earth's Crust, 6 f.s.), Set-$40.00 Examples of many common minerals are given. Atomic crystaline models are used to show how atomic structure and external shape are related. The process of crystal formation are shown. The combination of minerals to form rocks is illustrated by specimens.		Listed under I - A
5. Sedimentary Rocks ** Ward's Natural Science Establishment, Inc., 1962, 62 fr., color, (Materials of the Earth's Crust, 6 f.s.), Set-$40.00 The processes causing the formation of rock fragments are reviewed. Specimens illustrate the formation of the common sedimentary rocks. Chemical sedimentation forming limestone is illustrated. Cave deposition, formation by evaporation, and the organic origin of coal are shown.		Listed under I - A

* Good
** Excellent

IV. The Universe

Astronomy

B. Tools and laboratories used in the study of the universe

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. The Astronomer at Work ** McGraw-Hill Book Co., 40 fr., 1957, color (General Science Series, 4 f.s.), Set-$36.50 Each-$6.75 Discusses the work done by astronomers and describes the different tools used by them in their work, showing the operation of each of the major tools. Compares the different types of telescopes and presents some of the newer developments in astronomical tools.		
2. Exploring the Space Around Earth ** Films for Education & McGraw-Hill Book Co, 1958, 59 fr., color, (The Story of the Universe Series -- The Earth and Its Moon Series, SetI, 6 f.s.), Set-$42.00, each-$7.50 This filmstrip explains the use of rockets to explore space, clarifies their nature and operation, and discusses how and why they go into orbit or escape from it.	Gr. 9 *	
3. How Far Are the Stars? ** Films for Education & McGraw-Hill Book Co., 1961; 48 fr., color, (The Story of the Universe Series III - The Stars Series, 6 f.s.) Set-$42.00, each-$7.50 Filmstrip brings out the almost inconceivable distances to the stars and how these are measured.		Listed under IV - F

* Good
** Excellent

IV. The Universe

Astronomy - B (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. Information from the Satellites ** Films for Education & McGraw-Hill Book Co., 1958, 63 fr., color, (The Story of the Universe Series -- The Earth and its Moon Series, Set I 6 f.s.), Set-$42.00, each-$7.50 This filmstrip deals with some of the uses of satellites and the possible future uses of space stations. It considers the transparency of the atmosphere and examines the nature of light and its spectrum. It touches on the possibility of space travel.	Gr. 9 - **	
5. The Mount Wilson and Palomar Telescopes ** EBF, 1961; 32 fr., b/w, $3.00 each (Scanning the Universe Series, 7 f.s.) Uses photographs and drawing to describe the telescopes at Mt. Wilson and Palomar Observatories and explains the basic principles of their operation.		Better in color

* Good
** Excellent

IV. The Universe

Astronomy

C. Our solar system

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. **Between the Planets** ** Films for Education & McGraw-Hill Book Co., 1959, 59 fr., color, (The Story of the Universe Series -- The Solar System, Set II, 6 f.s.) Set-$42.00, each-$7.50 The nature of space is presented in this filmstrip's study of the planetoids, meteors, and comets. The reactions of molecules to stimuli, and the dangers of matter in space to interplanetary travel are discussed.		
2. **The Earth as a Planet** ** Films for Education & McGraw-Hill Book Co., 1958, 67 fr., color, (The Story of the Universe Series -- The Earth and Its Moon Series, Set I, 6 f.s.), Set-$42.00, each-$7.50 The earth is examined as a planet and as a home for man, in terms of its composition, structure, atmosphere, and seasons. The law of gravity is introduced by inquiring about the mass of the earth.		Listed under I - B
3. **Earth's Nearest Neighbor** ** Row-Peterson Textfilms, 1956, 46 fr., color, (Basic Science Education Series - Astronomy Group, 4 f.s.), $6.00 each The nature of the moon and its relationship to sun and earth are developed by an imaginary attempt at exploration of the moon's surface, in which the needs of the human body are measured against moon conditions. Throughout the film the children must reason, on the basis of known facts, as to what might happen to the "explorer" and what might help him to cope with the situation.		

* Good
** Excellent

IV. The Universe

Astronomy - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. The Earth's Shape and Size **	Gr. 5 **	

Films for Education & McGraw Hill Book Co., 1958, 56 fr., color, (The Story of the Universe Series - The Earth and Its Moon Series, Set I, 6 f.s.), Set-$42.00, each-$7.50

The student is introduced to the astronomical principles most of them discovered by ancient peoples, which explain how we know the shape and size of the earth.

Name and Description of Filmstrip	Other Grade Placements	Remarks
5. Exploring the Moon **	Gr. 6 - ** Gr. 9 - **	

EBF 1961, 29 fr., b/w, $3.00 each (Scanning the Universe Series, 7 f.s.)

Uses photographs of the moon to depict and describe its topography, its phases and its relationship with the earth. Points out the most important features of the lunar landscape.

6. Exploring the Sun **

EBF 1961, 29 fr., b/w, $3.00 each (Scanning the Universe Series, 7 f.s.)

Reveals many important things that have been learned about the sun from a study of photographs of the sun. Includes a sequence on sunspots; explains the use of spectroheliogram photos and includes photographs of the sun's prominences.

* Good
** Excellent

IV. The Universe

Astronomy - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
7. The Giant Planets ** Films for Education & McGraw-Hill Book Co., 1959, 46 fr., color, (The Story of the Universe Series - The Solar System, Set II, 6 f.s.) Set-$42.00, each-$7.50 This filmstrip introduces the outer planets--the giant planets Jupiter, Saturn, Uranus, Neptune, and the most recently discovered planet, Pluto. General characteristics of all are mentioned before each planet is discussed individually. Knowledge of the earliest known giant planets helped in the discovery of Neptune and Pluto, as well as measurement of the speed of light. Theories related to these planets are advanced and their satellites are discussed.		Difficult
8. Introduction to the Solar System ** Films for Education & MCGraw-Hill Book Co., 1959, 57 fr., color, (The Story of the Universe Series - The Solar System, Set II, 6 f.s.), Set-$42.00, each-$7.50 The filmstrip begins with a review of early knowledge and superstitions concerning the planets. The two major groups of planets, the inner planets and the giant planets, are discussed in their relationship to the sun and as we see them from the earth.		Difficult
9. Mars ** Films for Education & McGraw-Hill Book Co., 1959, 45 fr., color, (The Story of the Universe Series - The Solar System, Set II, 6 f.s.) Set-$42.00, each-$7.50 Could there really be a Man from Mars? The filmstrip presents evidence to show whether or not an inhabitant of the earth could live on Mars; whether or not there is life on that planet; and whether or not life on Mars could be similar to that on earth		Difficult

* Good
** Excellent

IV. The Universe

Astronomy - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
10. Mercury and Venus ** Films for Education & McGraw-Hill Book Co., 1959, 40 fr., color, (The Story of the Universe Series - The Solar System, Set II, 6 f.s.), Set-$42.00, each-$7.50 These two inner planets are compared with the earth in size, revolution, temperature, atmosphere, and possibility of life. Scientific theories with reference to heat are explained. Several methods of observation of the planets to obtain information about them are presented.		Difficult
11. The Moon ** Films for Education & McGraw-Hill Book Co., 1958, 72 fr., color, (The Story of the Universe Series - The Earth and Its Moons Series, Set I, 6 f.s.), Set-$42.00, each-$7.50 Using photographs taken by some of our country's leading observatories, this filmstrip presents a summary of what we know and do not know about the moon. The moon's size, shape, and distance from the earth are explained. The filmstrip discusses the phases of this satellite, only one side of which is ever seen. Finally, the geography of this one side is examined and analyzed.	Gr. 5 - *	Difficult
12. Motions of the Earth in Space ** Films for Education & McGraw-Hill Book Co., 1958, 65 fr., color, (The Story of the Universe Series - The Earth and Its Moon Series, Set I, 6 f.s.), Set-$42.00, each-$7.50 This filmstrip deals with the question of how we know that the earth rotates on its axis and revolves about the sun. It then looks at some of the consequences of these motions.		

* Good
** Excellent

IV. The Universe

Astronomy - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
13. On the Sky ** Films for Education & McGraw-Hill Book Co., 1961, 53 fr., color, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.), Set-$42.00, each-$7.50 This filmstrip reviews the appearance of the sky as seen by the naked eye, introduces concepts of magnitudes and numbers of stars, and then surveys some of the major constellations.	Gr. 5 - **	
14. The Sun ** Films for Education & McGraw-Hill Book Co., 1959, 44 fr., color, (The Story of the Universe Series, The Solar System, Set II, 6 f.s.), Set-$42.00, each-$7.50 The filmstrip answers questions such as: Does the sun burn? Is it a star? What are the dark spots which appear on it? It also gives an insight into the composition of molecules, and the nature of energy.		Difficult
15. The Sun and Its Family ** Row-Peterson Textfilms, 1956, 46 fr., (Basic Science Education Series - Astronomy Group, 4 f.s.), $6.00 each Because children possess much information about the solar system, many situations in this textfilm require them to remember data in order to test pictured situations. Asteroids, comets, meteors, and meteorites. The basic needs of the human are developed, and then tested against known conditions on other bodies in the solar system. Children can determine whether life as we know it could exist elsewhere.		

* Good
** Excellent

IV. The Universe

Astronomy - C (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
16. What Is a Solar System? * Benefic Press, 1961, 40 fr., color, (What Is It Series, 6 f.s.), ψ Presents basic facts about the solar system. For elementary grades.	Gr. 5 - **	
17. What Is in Space? ** Jam Handy Organization, 1961; 31 fr., color (First Adventures in Space Series, 6 f.s.) Paintings. Shows what man may explore in outer space, including meteors, the moon, the planets, the sun and other stars and the galaxies.	Gr. 5 - **	

* Good
** Excellent

IV. The Universe

Astronomy

F. Beyond the solar system

Name and Description of Filmstrip	Other Grade Placements	Remarks
1. Abnormal Stars ** Films for Education & McGraw-Hill Book Co., 1961, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.) Set-$42.00, each-$7.50 Interstellar matter, in some ways as important as the stars, needs careful treatment. Helps prepare a basis for understanding the final filmstrip on stellar evolution.	Gr. 5 - *	
2. Galaxies ** McGraw-Hill Book Co., 42 fr., color, (The Story of the Universe Series - The Universe Series - Set IV, 6 f.s.) Set-$42.00, each-$7.50 This filmstrip surveys the types and selected examples of stellar galaxies, with special attention to those nearest our own. It discusses their relative shapes, masses, and sizes, comparing them to the Milky Way. It closes with the evaluation of the nature of galactic collisions, and their effect.		
3. How Far Are the Stars? ** Films for Education & McGraw Hill Book Co., 1961, 48fr., color, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.), Set- $42.00, each-$7.50 Filmstrip brings out the almost inconceivable distances to the stars and how these are measured.		Listed under IV - B

* Good
** Excellent

IV. The Universe

Astronomy - F (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
4. The Life of a Star ** Films for Education & McGraw-Hill Book Co., 1961, 50 fr., color, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.), Set-$42.50, each-$7.50 Stars are shown to have a kind of life cycle characterized by birth, adolescence, maturity, decay and death, yet followed by later generations in part composed of matter formerly in the older stars.		
5. The Milky Way and Other Galaxies ** EBF 1961, 25 fr., b/w, $3.00 each (Scanning the Universe Series, 7 f.s.) Explains the nature of the Milky Way and presents close-up pictures. Shows views of other well known galaxies with comments on their sizes and shapes.		Should be in color
6. More About the Stars * Films for Education & McGraw Hill Book Co., 1961, 58 fr., color, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.) Set-$42.50, each-$7.50 Interstellar matter needs careful treatment.		
7. Nebulae * EBF, 1961; 28 fr., b/w, $3.00 each (Scanning the Universe Series, 7 f.s.) Explains that nebulae are clouds of dust and gas floating among the stars of our own galaxy. Uses photographs to reveal some of the best known nebulae, and describes their nature and size with captions.		Better in color

* Good
** Excellent

IV. The Universe

Astronomy - F (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
8. Pictures in the Sky ** Row-Peterson Textfilms, 1956, 46 fr., (Basic Science Education Series - Astronomy Group, 4 f.s.), $6.00 each A limited number of easily-found constellations are presented, with emphasis on location through first-magnitude stars. Of equal importance is the development of understanding of earth rotation, based on the apparent motion of stars. Reasons why summer and winter skies are different. Why the skies look different from different parts of the earth. The Textfilm is notable for careful review, testing, and reteaching.		
9. Universe and Space ** McGraw-Hill Book Co., 37 fr., color, (General Physical Sciences Series, 6 f.s.), Set-$45.00, each-$8.50 This filmstrip is designed to inform students about the matter and energy resources in the universe; describes the kinds of bodies in the universe; and show how these bodies are organized into systems called galaxies. The student is introduced to astronomical distances and instruments. The "birth, life, and death" of stars are explained; and finally, the concept of the expanding universe is presented.		
10. The Universe in Color ** EBF, 1961, 17 fr,, color, $3.00 each, (Scanning the Universe Series, 7 f.s.) Presents astronomical photograph including several of best known nebulae, and a shot of the great galaxy in Andromeda.		Excellent

* Good
** Excellent

IV. The Universe

Astronomy - F (continued)

Name and Description of Filmstrip	Other Grade Placements	Remarks
11. Why the Stars? ** Films for Education & McGraw-Hill Book Co., 1961, 50 fr., color, (The Story of the Universe Series - The Stars Series, Set III, 6 f.s.), Set-$42.50, each-$7.50 Covers basic physical properties of stars including true brightness, size, temperature, mass and peculiarities such as variability.		
12. You and the Universe ** Row-Peterson Textfilms, 1956, 43 fr., (Basic Science Education Series - Astronomy Group, 4 f.s.), $6.00 each Starting with a child at home, ever-widening geographical concepts are developed until the earth is seen as a constituent of a galaxy. Nature and number of galaxies. Development of a light-year as a measurement. Analysis of the motions in which the earth is involved. Unimportance of the human being in terms of size of universe, importance as the only known intelligent being.		

* Good
** Excellent

JP:gm
3-24-64

EQUIP & SUPPLIES

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES

Inventory Maintenance

During recent years each of our schools has been bringing their science facilities, equipment and supplies up to a basic minimum for instruction. It now has become necessary that a running inventory of all materials be kept and be completely checked for accuracy each year. It is realized that this requires hard work, but at the same time it is necessary if we are to keep track, prevent duplication and over-ordering of equipment and supplies which are on hand in the classrooms in the many storage facilities. If you do not now have an inventory of your room, we are asking that in the very near future a complete inventory of all equipment and supplies in your science room be made and checked at least once each year. If you desire, the minimum equipment list (copy of which is available in the Science Department Office) may be used as a basis for developing and keeping this inventory.

Procedures for Ordering

A number of difficulties arise each year during the requisitioning, bidding and purchasing of materials for your science classes. We should like to make the following suggestions regarding requisitions for science materials:

1. Confer with your principal as to the amount of money which you may spend on the purchase of science equipment and supplies.

2. All equipment and materials with complete specifications must be requisitioned on Form G-1000. (Please check the typed requisitions for any possible errors).

    a. If it is imperative that certain items be bought from a specific company, group those items on a separate requisition. Give a catalog number and all specifications for each item. (i.e. Grass frogs, preserved, 1-3/4" to 2-1/2" body length).

    b. On all other requisitioned items, please give your preferred company's catalog number. Be sure to include all specifications. (i.e. Microscope slide cover, glass, 22 mm. square, #1 thickness). It is permissible in your requisition for these items to specify, "similar to Cenco No. 19474" or "quality equal or better than Walker No. 4-686". When our purchasing department submits your requisitioned items with all specifications for bids, some money can be saved and you will still get the quality of materials which you desire.

    c. It is suggested that you list all live specimens and cultures on a separate requisition. Future dates for delivery should be indicated, if possible. If date of delivery cannot be determined when the requisition is made, mark requisition, "To be delivered on demand by the instructor".

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES (cont.)

3. Use the most recent catalog and price list for all requisitioned items. Prices are increasing all the time. Be sure to allow for some possible price increases when requisitioning. (May we suggest that you put the least needed items at the bottom of the requisition and indicate which ones may be dropped from your order if your science allotment does not cover all items, due to price increases?) The prices which we receive on bids are the only guaranteed prices--catalog prices are not guaranteed prices! Most scientific supply companies tell us that they cannot furnish a new catalog to each teacher. When the Science Office receives a new catalog for your school, we send it to your librarian.

4. The list of scientific equipment and supply companies and their respective representatives is for your use. Please keep it for your future reference. If you receive materials from any company which do not meet your specifications as included on your requisition, it is your responsibility as the science instructor to immediately contact the company or its representative and see that the Minneapolis Public Schools secure value received from the equipment companies.

If we can be of any assistance in locating science equipment or supplies which you need in instruction, do not hesitate to call upon us for assistance.

Procedures if New Equipment or Supplies Arrive Damaged:

When newly ordered equipment or supplies arrive in a damaged condition,
(1) the public carrier (usually the Post Office or the Railway Express) should be informed immediately of such damage. In most cases they will send one of their men to examine the carton and damaged equipment. It will be necessary for you to work with your requisition clerk to see that this is carried out. Following this examination by the public carrier you should,

(2) inform the scientific supply company from whom you have purchased this material that it was damaged in transit and you desire replacements. This cannot be done by the clerks in the Central Office as they do not understand the conditions that exist in your school building. Please have your building requisition clerk do this letter writing for you.

It is necessary that you, as the classroom science instructor, see that our Board of Education secures value received and equipment which is ordered and paid for. May we ask your assistance in carrying out both of these steps as indicated above?

Procedures for Repair of Equipment

As equipment is used in the teaching of science, it eventually wears out or may become unavoidably damaged. When a piece of equipment is no longer usable for science instruction, it should be repaired and returned to service or be removed from your inventory and the Board of Education inventory kept in the Finance Department. If you desire any assistance regarding decisions to repair equipment or remove it from inventory, do not hesitate to call upon the Science Department Office for suggestions.

INSTRUCTIONS FOR ORDERING AND REPAIR OF SCIENCE EQUIPMENT AND SUPPLIES (cont.)

If you believe a specific piece of equipment can be repaired, you should carry out the following steps in cooperation with your requisition clerk:

1. Write a letter to the manufacturer or supplier of the equipment requesting directions for shipment of the equipment to them for possible repair. Be sure to instruct them in the letter that upon receipt of the equipment, they are to examine the equipment and then send you a firm bid for the price of the repairs. Warn them that they are not to repair the equipment until they have received a "purchase order" for the work. When you receive the letter of firm bid and shipping instructions from the manufacturer, ship the equipment as directed and proceed with the next step.

2. When you receive the firm bid and you feel that the estimated cost of repair is within reason, you should have a request for repair filled out on the regular requisition blank, form G-1000, and fasten the firm bid letter to it. Forward this requisition to the Board of Education Business Office and they will follow through on sending the purchase order to the manufacturer. If you feel that the cost of repair is too great, request the manufacturer or supplier to return the equipment to you. Before you dispose of the equipment contact the Science Department Office for advice.

3. When the equipment has been repaired and returned to you in satisfactory condition, sign the blue copy of the purchase order which your requisition clerk has in her files. Have this blue copy forwarded to the Board of Education Business Office for payment.

Many pieces of science equipment can be repaired locally such as compound microscopes and aquariums. If the Science Department Office can be of assistance to you in locating sources of repair, do not hesitate to call them.

Audio visual equipment needing repairs should be referred to the building audio-visual coordinator.

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5-14-63
Revised 12-14-65

EQUIPMENT AND SUPPLIES FOR SEVENTH, EIGHTH AND NINTH GRADE SCIENCE

ecommended inimum ntity		Equipment Description	* Unit Cost	On Hand Inventory	To Be Ordered
chool	Room				
1		Air pump, with pump plate (23 cm in diam.), vacuum and pressure with motor, 115 volts AC, Cenco 90515-1	140.00		
1		Barometer, mercurial, 0-4000 ft., Cenco 76890	60.00		
1		Bell Jar, 15" x 8-3/4", Cenco 14302-3	28.25		
3		Bins, 16" x 16" x 23½", mobile, metal lined, Sheldon T3170	70.00		
	1	[redacted]	[redacted]		
1		Pump Plate, with guard plug, 27 cm diam., Cerco 94205 (not needed with Cenco 90515-1)	41.00		
1		S.V.E. Microbeam Attachment, Trans-Mississippi Biological Supply Co.	54.50		

* Unit Cost as of January 1961.

Recommended Minimum Quantity --		Geology Equipment and Supplies Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
1		Teacher's Mineral Set (3" size) Consist of the following: Hematite, Kaolinite, Limonite, Quartz, Siderite, Taconite, Apatite, Asbestos, Azurite, Bauxite, Calcite, Carnotite, Chalcopyrite, Onyx, Corrundum, Diamond, Fluorite, Garnet in Schist, Graphite, Gypsum, Halite (rock salt), Manganese, Marble, Mica (Biotite), Native copper, Obsidian, Opalite, Orthoclase, Pyrite, Pyrrhotite, Schoelite, Shale (Sylvite), Sphalerite, Sulfur, Talc, Topaz, Tourmaline, Willemite, Basalt, Conglomerate, Dolomite, Gneiss, Granite, Limestone, Peat, Sandstone, Schist, Shale, Slate, Marble, Quartzite, Soapstone. Magnetite.	60.00		
	1	Student's collection, (2" size), are as follows: Hematite, Kaolinite, Limonite, Magnetite, Quartz, Asbestos, Bauxite, Carnotite, Calcopyrite, Fluorite, Galena, Graphite, Halite, Mica (Biotite, Native copper, Pyrite, Quartz (Jasper)	8.00		
	36	Bag of 36 unknown minerals for student laboratory practice	2.90		

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*Unit Cost as of January 1961

ecommended inimum antity --		Equipment (charts and models) Description	* Unit Cost	On Hand Inventory	To Be Ordered
ol	Room				
1		Collection of Beneficial Insects, comparable teaching collection, General Biological Supply House (Turtox) 9D814	31.00		
1		Collection of Harmful Insects, comparable teaching collection, General Biological Supply House (Turtox) 9D813	31.00		
1		Universal Planetarium, simplified, Universal Products, Nystrom	29.50		

* Unit Cost as of January 1961.

commended nimum antity --		Supplies (permanent) Description	# Unit Cost	On Hand Inventory	To Be Ordered
ol	Room				
1		AC Armature (to use on Cenco 79945 St. Louis motor), Cenco 79949	4.50		
	1	Ammeter, AC, panel mount, 0-10 amps., model RF-2C, Allied Radio 67F649	2.94		
	1	Ammeter, DC, panel mount, 30-0-30 amps., model RF-2C, Allied Radio 67F659	1.81		
	6	Animal Cage , round form, 3 mesh, 18 gauge, wire cloth, galvanized after weaving, 8½" dia., 9" high, with pan 1½" deep, Walker 1-270	8.10		
	6	Animal Cage , Army Medical School Model, wire cloth, 3 mesh, 18 gauge, galvanized, 9" wide x 9" high x 15" long, Walker 1-260 or Cenco 44042	15.60 13.00		
	1	Apron, laboratory, polyvinyl, light weight, 29" x 35", Cenco 10096	.95		
	2	Aquarium, steel frame, 18" x 10" x 9½", 6 gal., Bd. of Ed., Educational Supplies, Code 224	8.00		
	1	Aquarium Air Pump, "Oscar Jr." #55, Trans-Mississippi Biological Supply #384	6.20		
	1	Aquarium, brass valve , 3 way (1 intake, 2 outlets), Trans-Mississippi Biological Supply	.20		
1		Aquarium Glass Cleaner, Welch 8340E	1.00		
	1	Aquarium Heater, thermostat, 50 watt, 8" long thermostat, Cenco 57142-1	6.25		
	1	Aquarium Net, frame 3" wide, bag 3½" deep, Cenco 57220	.35		
	1	Aquarium Sub-sand Filter, Trans-Mississippi Biological Supply #175	2.75		
	6	Attachment Plug Base, Bd. of Ed., Educational Supplies	.039		
	1	Balance, dial spring, 500 gram in 5 gm divisions and 18 ounce in 1/4 oz. divisions, Welch 4078	2.65		
	1	Balance, dial spring, 2000 gram in 10 gm divisions and 72 ounce in 1/2 oz. divisions, Welch 4079	2.65		
	1	Balance, Harvard trip, with stainless steel pans, double beam, metric, 210 gm beam capacity Walker 3-434	24.00		

Unit Cost as of January 1961.

uipment and Supplies for Seventh, Eighth and Ninth Grade Science

commended nimum ntity		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
ool	Room				
	1	Ball and Ring Apparatus, brass with hardwood handles, Cenco 77450	4.15		
	1	Barometer, aneroid, dial type, Bd. of Ed., Educational Supplies	3.53		
	2	Battery Jars, 4" x 5", 2 pint capacity, Cenco 15200-2	.73		
	2	Battery Jars, 6½" x 8", 8 pint capacity, Cenco 15200-4	1.46		
	1	Beehive Support, heavy zinc, 13½" dia. x 1-5/8" high, 3/4" hole, Cenco 15580	2.25		
	1	Bell, electric, AC or DC, 1½-3 volts required, Cenco 84010-1	1.65		
1		Bell Jar, open top, 7/8" hole, 10" x 6", Cenco 14305-2	17.50		
	24	Binding Post, Spring, Fahnenstock patent, single, Cenco 83825-2	.14		
	24	Binding Post, Spring, Fahnenstock patent, double, Cenco 83825-3	.21		
	1	Blowpipe, brass, 8", Cenco 10260	.45		
	1	#419 Bottle, "Acid Hydrochloric, Concentrated," Cenco 10790	.60		
	1	#422 Bottle, "Acid Nitric, Concentrated," Cenco 10790	.60		
	1	#420 Bottle, "Acid Sulfuric, Concentrated," Cenco 10790	.60		
	1	#15 Bottle, "Ammonium Hydroxide," Cenco 10790	.60		
	1	#26 Bottle, "Silver Nitrate" (amber), Cenco 10790	.60		
	6	Brass Keyless Socket, Bd. of Ed., Maintenance Supplies	.162		
	2	Broom, whisk, Bd. of Ed., Educational Supplies	.49		

* Unit Cost as of January 1957

commended nimum antity --		Supplies (permanent) Description	Unit Cost	On Hand Inventory	To Be Ordered	
ool	Room					
	2	Brush , bench, 9", Bd. of Ed., Educational Supplies	1.73			
	3	Brush , test tube, natural bristles, ½"-5/8", Cenco 10968-2	.13			
	3	Brush , test tube, natural bristles, 3/4"-1", Cenco 10968-3	.17			
	12	Burner, Bunsen, H-base, for natural gas, ½", Cenco 11002-3	1.55			
	1	Burner, high temp., H-base, for natural gas, Cenco 11017-3	2.70			
	3	Burner, wing top, to fit ½" dia. burner tube, Cenco 11205-2	.36			
	1	Buzzer, electric, AC or DC, Cenco 84020	1.75			
	1	Capillary Tubes, set of 7 in support, Stansi 1040	1.95			
	1	Capillary Tubes, set of 7 without support, replacements, Stansi 1025	.75			
	1	Cartesian Diver Set, with 8" x 1½" jar and rubber diaphragm, Cenco 76067	2.15			
1		Case for use with Cenco 76890 mercurial barometer, Cenco 76892	7.75			
	1	Cat Skin (half skin), 20 x 20 cm, Cenco 78640	3.70			
	1	Cell, Student's Demonstration, complete with glass jar, porcelain cup, porous cup, and 10 elements, Cenco 79280	4.90			
	1	Chart of the Atoms, latest edition, formed-metal chart molding top and bottom, eyelets, Welch 4854	7.50			
	1	Chart, Metric, 27" x 44", metal edging, 2 hangers, Welch 149	5.45			
1		Chick Development Stages, bioplastic mount, Ward Pz6492	10.50			

Unit Cost as of January 1961.

Equipment and Supplies for Seventh, Eighth and Ninth Grade Science

ecommended inimum Quantity --		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
	4	Clamp, Burette, 6" x 1½", symmetrical, screw clamp type, Cenco 12102	1.65		
	2	Clamp, Day's, spring pinchcock for tubing up to 3/8", Cenco 12180	.15		
	12	Clamp, Test Tube, Stoddard's, Cenco 12155	.13		
1	1	Cloths Moth, Life History, Riker mount, General Biological Supply House (Turtox) 9D648	6.75		
	1	Color Disks, 8.5 cm. dia., adjustable, with electric motor, to be run on 2 or 3 dry cells, Welch 2486	22.50		
1		Common Igneous Rocks, Wrights XCC1	14.95		
1		Common Metamorphic Rocks, Wrights XCC3	14.95		
1		Common Sedimentary Rocks, Wrights XCC2	14.95		
	1	Compound Bar, invar steel and brass with hardwood handle, 25 cm long, Cenco 77455	1.30		
	1	Condenser, Liebig, stopper assembly, lime glass, 400 mm jacket, 625 mm long, Cenco 14455-2	2.40		
	2 pkg.	Connector Tip, Universal (12 to pkg.), Cenco 83900	.95		
	1	Convection Apparatus, Gases, metal with glass wall and 2 glass chimneys, Cenco 77590	7.50		
1		Cork Borer, set of 6 (3/16" to ½"), brass, Cenco 12465-2	2.65		
1		Cork Borer Sharpener, sharpens from 3/16" to 1", Cenco 12485	4.20		
	2 pkg.	Corks, XXXX quality, assorted sizes 1 to 11 (100 to pkg.), Cenco 12422	2.25		
	1 pkg.	Corks, XXXX quality, assorted sizes 3 to 16 (100 to pkg.), Cenco 12424	3.75		
	1 pkg.	Corks, XXXX quality, assorted sizes 12 to 26 (100 to pkg.), Cenco 12406	6.30		

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* Unit Cost as of January 1961.

ecommended inimum ntity --		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
chool	Room				
	1 pkg.	Darning Needles (10 to pkg.), 7.5 cm long, Cenco 78360	.25		
	1	Deflagrating Spoon, stainless steel, 3/4" dia., 15" long, Cenco 12662	.47		
	1	Demonstration Balance, meter stick type, knife edge clamp and heavy iron support, Cenco 75560	2.60		
	1	Dissecting Set, single-fold leatherette case, with scalpel, forceps, scissors, 2 needles and 6" ruler, Cenco 53004	2.80		
	1	Electrolysis Apparatus, Brownlee form, platinum electrodes, with 2 test tubes, without jar, Cenco 81185	5.75		
	1	Electromagnet, horseshoe type, with 3 brass wire connectors, 11.5 cm long, Cenco 79640	11.50		
1		Electromagnet Attachment (to use on Cenco 79945 St. Louis Motor), Cenco 79947	6.15		
	1	Exciting Pad, silk, 20 x 25 cm, Cenco 78635	.50		
	1	Exciting Pad, wool felt, 20 x 30 cm, Cenco 78630	.60		
	1	Filter Pump and Hose Nipple, brass and monel metal, with plug, Cenco 13195	4.65		
	1	Fire Blanket, wool, 62" x 34" (request through principal), Bd. of Ed., Equipment	3.91		
	3	Fire Extinguisher, carbon dioxide, 5 lb., (request through principal), Bd. of Ed., Equipment	15.00		
	1	First Aid Cabinet (request through principal), Bd. of Ed., Equipment	5.19		
	1	Force Pump, working plastic model, with pressure-equalizing air chamber, cylinder 1-3/4" dia., Welch 1107	5.65		
	3	Forceps, chemical, steel, 125 mm, Cenco 13480	.26		
	1	Forceps, straight, fine point, 110 mm length, nickel plated steel, Cenco 53112	.30		

* Unit Cost as of January 1961.

ecommended inimum ntity		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
chool	Room					
	1	Friction Rod, hard rubber, one end tapered, 25 cm long by 13 mm dia., Cenco 78620	.70			
	1	Friction Rod, solid glass, one end blunt and ground to midpoint, 30 cm long by 13 mm dia., Cenco 78605	1.10			
1		Frog Metamorphosis, bioplastic mount, Ward Pz6204	9.50			
	1	Gyroscope, simple form, 5.5 cm dia. wheel, 6.5 cm support rod on iron base, Cenco 74780	2.35			
1		Honey Bee (Apis Mellifica), Life History, Riker mount, General Biological Supply House (Turtox) 9D677	8.50			
25 ft.		Hose, Garden, 5/8" (with couplings), Bd. of Ed., Maintenance Supplies	.13			
	1	Hot Plate, electric, cast aluminum, Temco, 660 watts, Walker 42-834 or 550 watts, Cenco 16630	27.50 22.75			
	1	Hygrometer, Stewart, Humidiguide, Taylor, range of temp. 40°-116°F., Cenco 76990	8.10			
	1	Inclined Plane Board with pulley, without accessories, Cenco 75845	5.00			
	1	Insect Net, nylon , General Biological Supply House (Turtox) 105 All-N	4.85			
	1	Jack Model Screw, base 32 mm dia., range 57-92 mm, Cenco 75800	4.20			
	1 pkg.	Knitting Needles (12 to pkg.), steel, Cenco 78365	.55			
	1	Lens, double concave, 3.75 cm dia., 10 cm focus, Cenco [illegible]50-1	.90			
	1	Lens, double convex , 3.75 cm dia., 10 cm focus, Cenco [illegible]-2	.65			
1		Lenses, Demonstration Set, six types, 5.0 cm dia., Cenco 85680	8.25			

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* Unit Cost as of January 1961.

Recommended Minimum Quantity School	Room	Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
	5	Lever Holder, to fit standard meter stick, knife edges, loop for suspension, with set screw, Cenco 75555	1.15			
	3	Library Filmstrip Film Case (holds 12 film strips) [illegible] Film & Radio Co., Inc., Richmond, Virginia	1.25			
	1	Lift Pump, working plastic model, cylinder 1-3/4" dia., Welch 1106	4.95			
	3 pr.	Magnets, Bar, steel, in wood box with keeper, 6 mm x 19 mm x 15 cm, Cenco 78280	1.80			
	12	Magnetic Compass, 10 mm dia., mounted in brass case, Cenco 78430-1	.20			
	12	Magnetic Compass, 45 mm dia., mounted in brass case with ring, Cenco 78430-4	.85			
	1 pr.	Magnet, Cylindrical, Alnico, 180 mm long by 15 mm dia., Cenco 78291-3	5.60			
	1	Magnet, Floating, 50 mm long by 4.5 mm dia., mounted in plastic support, Cenco 78300	3.25			
	1	Magnet, Horseshoe, Alnico, with keeper, 28 x 29 mm, pole separation 8 mm, Cenco 78326-1	.92			
	1	Magnet, Natural (lodestone), Cenco 78250	.18			
	1	Magnetic Needle, brass bearing, mounted on steel pivot, Cenco 78415	2.45			
	1	Magnetic Needle, dipping, mounted on horizontal pivot, in brass frame, graduated arc, Cenco 78425	13.25			
1		Magneto Electric Generator, on 12.5 x 25 cm hardwood base, with mounted Edison socket and incandescent lamp, Cenco 79895	22.25			
	1	Magnifier, Reading Glass, round, 2½" lens dia., Cenco 60410-2	1.70			
36		Magnifier, Tripod, aperture 20 mm, 10X magnification, Cenco 60020	1.10			

* Unit Cost as of January 1961.

commended inimum ntity --		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
hool	Room				
	1	Metal Case for Fire Blanket, Bd. of Ed., Equipment, Code 1087	4.25		
	1	Meter Stick, maple, 2 cm square, faces with 1 m, 1/10 m, 1/100 m, and 1/1000 m graduations, Cenco 73105	8.25		
	6	Meter Stick, maple, English graduated into inches and eighths; metric graduated into dm, cm, mm; Cenco 73115	.85		
	1 pkg.	Micromount Cards (100 to pkg.), no glass, General Science Service Co.	2.50		
1		Microphone, Demonstration, Stansi 4890	3.50		
	4	Microscope, M-110, 50X and 100X magnifications, with illuminator above and below, plus 12 prepared slides, General Sci. Service Co.	17.50		
1		Minerals in Moh's Scale of Hardness, 9 specimens, Cenco 52648	3.30		
	2	Mirror, spherical, concave and convex, 75 mm dia., 20 cm focus, Cenco 85425	1.00		
1		Mirror, spherical, concave, demonstration type, 16" dia., 37 cm focus, Cenco 85407	10.00		
1		Mirror, spherical, convex, demonstration type, 16" dia., 37 cm focus, Cenco 85417	10.00		
1		Monarch Butterfly (Danaus Archippus), Life History, Riker mount, Turtox 9B585	7.00		
1		Motor, St. Louis, with 2 bar magnets, 2 pole DC armature, without other accessories, Cenco 79945	13.50		
1		Order of Insects, Riker mount, Turtox 9D811	8.50		
	1	Pail, galvanized, 12 qts., Bd. of Ed., Educational Supplies	.86		
	1	(Pulse or) Palm Glass, Franklin's, 18 cm long, Cenco 77730	2.40		
	2	Pan with Holder, for model pump, 9½" x 5½", rust-resistant finish, Welch 1109	2.75		
		Pulse (or Palm) Glass, Franklin's, 18 cm long, Cenco 77730	2.40		

commended imum tity		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
hool	Room				
	1 pkg.	Pith Balls, suspension type, with silk cord, (pkg. of 5), Cenco 78650-1	2.35		
	5	Plug, rubber handle grip, "spring action," Cenco 84145	.18		
1		Power Supply Unit, AC-DC, up to 5.3 volts DC and 11 volts AC, Cenco 79548	22.00		
	1	Prism, Equilateral, flint glass, 28 mm face x 75 mm length, Cenco 85505-1	2.30		
	1	Prism, Right Angle, flint glass, angles 45° and 90°, widest face 32 mm, 50 mm long, Cenco 85520	2.10		
	3	Pulley , Single Sheave, bakelite, grooved sheave 2" dia., hook links top and bottom, Cenco 75625	.80		
	2	Pulleys, Double Tandem, bakelite, grooved sheaves 2" and 1½" dia., hooks top and bottom, Cenco 75644	1.55		
	2	Pulleys, Triple Tandem, bakelite; grooved sheaves 2", 1½", and 1" dia.; hooks top and bottom, Cenco 75646	2.05		
	1	Push Button, pressed metal, 2¼" dia., Cenco 84040	.42		
	1	Radiometer, Crookes, rotating shaft with 4 vanes in light glass bulb, bakelite base, Cenco 77640	3.00		
1		Rain Gauge, zinc vessel 3" dia. by 13", copper cup 3" dia., brass tube 1" graduated to 0.01" readings, Cenco 77025	14.00		
	1	Right Angle Clamp, aluminum alloy, thumb screw, for rod ½" dia., Cenco 12241-1	1.10		
	2	Riker Mount , standard size F, Turtox 100456	2.20		
	6	Ring, Iron, with clamp, 4" inside dia., Cenco 18005-3	1.05		
	6	Ring, Iron, with clamp, 5" inside dia., Cenco 18005-4	1.15		

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* Unit Cost as of January 1962.

Recommended Minimum Quantity		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
1		Rock Cycle, Wrights XCC4	10.95		
	3 lb	Rubber Stoppers, assorted sizes 2 to 6, Cenco 18153-1	1.25		
	15 ft.	Rubber Tubing, red medium wall, 1/4" inside dia. x 1/16" wall, Cenco 18200-3	.30 /ft.		
	10 ft.	Rubber Tubing, red medium wall, 3/16" inside dia. by 1/16" wall, Cenco 18200-2	.27 /ft.		
	5 ft.	Rubber Tubing, red extra heavy wall, ¼" inside dia., Cenco 18204-3	.52 /ft.		
	6	Scissors, 6", Bd. of Ed., Educational Supplies, Code 224	1.94		
	1	Soft Iron Rod, 15 cm x 13 mm, Welch 1805	.25		
1		Spray Gun, Hudson #433A, 1 qt., Bd. of Ed., Maintenance Supplies	1.59		
1		Spring Balance, demonstration, Sutton, 20 cm dial, graduated 0-22 (100-2200 gm) in half unit divisions, Welch 4075	6.00		
1		Spotlight Pointer, battery operated, with incandescent lamp and 2 batteries, Cenco 56115	9.55		
	2	Spreading Board, adjustable, 5-3/4" x 12-7/8", groove adjustable from 1/8" to 3/4", Cenco 54184	3.75		
	12	Support, iron, rectangular base, 4-7/8" x 8", 20" rod with 3/8" dia., Cenco 19070-2	1.90		
	3	Support, Test Tube, hardwood, 10 tubes, with drying pins, Cenco 19190	1.65		
	2	Switch, Knife, single pole, single throw, porcelain base (25 amp), Cenco 84315	.40		
1		Telephone Receiver, Stansi 4875	2.50		
1		Telephone Transmitter, demonstration form, Cenco 80800	4.90		
	1	Test Tube Basket, stainless steel wire, rectangular, 6" x 6½" x 6¾", Cenco 48521-2	6.00		

* Unit Cost as of January 1961

ommended imum		Supplies (permanent) Description	* Unit Cost	On Hand Inventory	To Be Ordered
hool	Room				
	2	Tongs, Crucible, parkerized steel, double bent, Cenco 19630	.38		
	2	Triangle, round chromel, 1½" side, Cenco 19705-2	.26		
	1	Trough, glass, pneumatic, 11½" x 8" x 8", Cenco 15575	12.75		
8		Trowel, collecting and transplanting, 6" steal blade, hardwood handle, Cenco 50440	.70		
	1	Tuning Fork, unmounted, non-tarnishing alloy, C', 256 V.P.S., Cenco 84560-3	5.50		
	1	Tuning Fork, unmounted, non-tarnishing alloy, C", 512 V.P.S., Cenco 84560-11	5.00		
1		Universal Sun Dial, 25 mm dia., with instructions, Welch 840	7.50		
	1	Voltmeter, AC, panel mount, 0-150 volts, model RF-2C, Allied Radio 67F671	3.53		
	1	Voltmeter, DC, panel mount, 0-10 volts, model RF-2C, Allied Radio 67F637	1.81		
	4	Weather Forecasting Computer, 4" x 4", with instructions, Welch 1253	.25		
	1	Weather Thermometer, Fahrenheit, maximum and minimum, bimetallic dial type, knob reset, Taylor 5321 or Cenco 19474	7.65		
	1 set	Weights, in block, 1 gm to 1000 gm, Class C, Cenco 9125-4	13.50		
1		Weights, avoir., lb. and oz., Class II, Cenco 8960-1	16.00		
	1 set	Weights, hooked, in block, 10 gm to 1 kg, Cenco 9810	11.25		
	1	Wheel and Axle, aluminum, grooved wheels; 12, 8, 4, and 2 cm dia.; 13 mm rod without clamp, Cenco 75746	5.70		

* Unit Cost as of January 1961

ecommended inimum ntity chool	Room	Supplies (permanent) Description	Unit Cost	On Hand Inventory	To Be Ordered	
	6	Wire Gauze, galvanized iron, 16 mesh, 5" x 5", Cenco 19965-2	.22			
	6	Wire Gauze, galvanized iron, asbestos center, 5" x 5", Cenco 19970-2	.26			

Unit Cost as of January 1961.

ecommended inimum ntity		Supplies (Tools) Description	* Unit Cost	On Hand Inventory	To be Ordered	
hool	Room					
	1	Bit, auger, square shank, ¼", #4, Bd. of Ed., Educational Supplies	.95			
	1	Bit, auger, square shank, 5/16", #5, Bd. of Ed., Educational Supplies	.95			
	1	Bit, auger, square shank, 3/8", #6, Bd. of Ed., Educational Supplies	1.00			
	1	Bit, auger, square shank, 7/16", #7, Bd. of Ed., Educational Supplies	1.09			
	1	Bit, auger, square shank, ½", #8, Bd. of Ed., Educational Supplies	1.18			
	12	Blade, coping saw, 6½" (Disston #25), Bd. of Ed., Educational Supplies	.02			
	6	Blade, hack saw, 10", 24 teeth, Bd. of Ed., Educational Supplies	.10			
	1	Brace, auger bit, square shank, ratchet, 10" sweep, #945, Bd. of Ed., Educational Supplies	4.55			
	2	File, triangular, 4", Cat. No. 83925, Bd. of Ed., Educational Supplies	.34			
	1	Glass Cutter, steel wheel, "Red Devil," Bd. of Ed., Maintenance Supplies	.24			
1		Gauge, sheet metal, Starrett #283, Bd. of Ed., Educational Supplies	5.39			
1		Gauge, wire, Starrett #188, Bd. of Ed., Educational Supplies	5.05			
	1	Hammer, claw, 10 oz., Stanley #52½, Bd. of Ed., Educational Supplies	2.33			
	3	Knife, sloyd, Murphy #0, Bd. of Ed., Educational Supplies	.49			
	1	Plane, Jack, Stanley #5, Bd. of Ed., Educational Supplies	6.25			
	1	Plier, combination, adjustable, 6" long, tool steel, Cenco #5525	.55			
	1	Plier, long nosed, side cutting 5½" long, 1-3/4" jaws, Cenco #3517	1.81			

Unit Cost as of January 1961.

ecommended mber [illegible] [illegible]	Supplies (Tools) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1	Push Drill, [illegible], Warner Hardware	2.95		
1	Saws, coping, 6", Disston #75, Bd. of Ed., Educational Supplies	.34		
1	Saws, cross cut, 20", 10 point, Atkins #51, Bd. of Ed., Educational Supplies	3.82		
1	Saws, back, pistol grip, #1237, Bd. of Ed., Educational Supplies	1.41		
1	Screw Driver, 1½" blade, 1/8" point, #21, Bd. of Ed., Educational Supplies	.50		
1	Screw Driver, 3" blade, 3/16" point, #20, Bd. of Ed., Educational Supplies	.39		
1	Screw Driver, 6" blade, 5/16" point, Bd. of Ed., Educational Supplies	.52		
1	Screw Driver, Phillips head, 3½" x ¼" blade, size 2 head, Bd. of Ed., Educational Supplies	.35		
1	Snips, tinner's, 1½", Wiss #13, Bd. of Ed., Educational Supplies	1.20		
1	Soldering Gun Kit, dual heat (90 or 125 watt), Weller, model 8200K, Warner Hardware	7.95		
1	Vise, wood and metal, 3" jaw, diamond-simplex, [illegible], Warner Hardware #10	6.67		

Unit Cost as of January 1961.

ecommended inimum Quantity		Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
School	Room				
	1	Barometer Tube, plain, 86 cm long, Cenco 76820	1.00		
	4	Beaker, Pyrex, 250 ml, low form with lip, Cenco 14265	.39		
	4	Beaker, Pyrex, 400 ml, low form with lip, Cenco 14265	.46		
	12	Bottle, flint glass, wide mouth, 8 oz., Cenco 10320	.075		
	12	Bottle, flint glass, wide mouth, 16 oz., Cenco 1032	.11		
	2	Crucible, Coors, low form, 12 ml capacity, porcelain, 37 mm dia., 21 mm high, Cenco 18540-2	.38		
	12	Culture Dish, Petri, Pyrex, 100 mm dia. upper dish, 15 mm height of lower dish, Cenco 44370-4	.60		
	1	Cylinder, double graduated, 100 ml, 1 ml divisions, Cenco 16105	1.55		
	2	Dish, Evaporating, porcelain, Coors, 75 mm dia., Cenco 18575-00A	.47		
	4	Flask, Boiling or Florence, Pyrex, flat bottom, 250 ml, Cenco 14805	.78		
	2	Flask, Boiling or Florence, Pyrex, flat bottom, 500 ml, Cenco 14805	1.00		
	5	Flask, Erlenmeyer, Pyrex, 250 ml, for rubber stopper No. 6, Cenco 14905	.51		
	4	Flask, Erlenmeyer, Pyrex, 500 ml, for rubber stopper No. 7, Cenco 14905	.61		
	2	Funnel, Chemical, Kimble, 75 mm short stem, Cenco 15052	1.00		
	2	Funnel, Chemical, Kimble, 100 mm short stem, Cenco 15052	1.40		
	1 pkg.	Glass Plates, clear, 75 x 75 mm (12 to pkg.), Cenco 17730-2	.50		
	2 lb.	Glass Rod, 6 mm, Cenco 14050	.95 /lb.		
	5 lb.	Glass Tubing, 6 mm, Cenco 14076	.95 /lb.		

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* Unit Cost as of January 1961

commended nimum tity	Room	Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	36	Magnifier , small, 3-5/8" long, fitted with two spherical convex lenses (3X and 7X) and two cylindrical magnifiers, all plastic, Bd. of Ed., Educational Supplies	.30		
	2 pkg.	Medicine Droppers, straight (12 to pkg.), Cenco 15302	.46		
	1 box	Microscope Slides, non-corrosive laboratory grade, 75 x 25 mm (72 to box), Cenco 66310	1.50		
	1 box	Microscope Slide Cover Glasses, student grade, 18 mm square, No. 2, Cenco 66535-2	1.90		
	1	Mortar and Pestle, 100 mm dia., Cenco 17381	1.66		
50		Pot , clay, plant, 2½", Red Wing Pottery	.04		
50		Pot , clay, plant, 3", Red Wing Pottery	.05		
50		Pot , clay, plant, 4", Red Wing Pottery	.10		
20		Pot , clay, plant, 5", Red Wing Pottery	.15		
[illegible]		Pot , clay, plant, 6", Red Wing Pottery	.20		
10		Pot , clay, plant, 8", Red Wing Pottery	.50		
000		Pots, paper, plant, Vitagreen, 2½" ($1.40 per 100) Danish Seed Co.	8.60 /1000		
	36	Receptacle, miniature, porcelain (for Cenco 84420 lamps), Cenco 84765	.25		
	72	Test Tube , Pyrex, with rim, 150 x 20 mm, Cenco 15785-7	.098		
	24	Test Tube , Pyrex, with rim, 200 x 25 mm, Cenco 15785-10	.174		
	1	Thermometer, double scale, centigrade and Fahrenheit, laboratory grade, engraved stem, -20° to 110°C in 1° division and 0° to 230°F in 2° divisions, Cenco 19325-1	2.70		
	2	Thermometer, laboratory grade, etched scale, yellow backed, -10° to 110°C with 1° divisions, Cenco 19242-1	2.20		

* Unit Cost as of January, 1961.

ecommended inimum ntity — chool Room	Supplies (Temporary) Description	* Unit Cost	On Hand Inventory	To Be Ordered
6	Tube , Funnel, thistle top, 14" stem, Cenco 15706-2	.64		
30	Vial , Shell, #2, 7 ml capacity, 15 x 75 mm, Cenco 10700-2	.043		
36	Vial , Shell, #7, 30 ml capacity, 25 x 95 mm, Cenco 10700-7	.097		
12	Watch Glass , Pyrex, 75 mm, Cenco 15850	.15		

* Unit Cost as of January 1961.

Recommended Minimum Quantity -- School	Room	Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1 lb.		Acid, Hydrochloric (muriatic acid), Tech. (available in 1 gal. bottle at $1.85)	.89		
[illegible]		Acid, Nitric, Tech. (available in 1 gal. bottles at $4.00)	2.13		
1 lb.		Acid, Sulfuric, Tech. (available in 1 gal. bottles only at $1.85)	.95		
1 lb.		Agar Agar Flakes, Difco, flake (¼ lb. available at $3.15)	8.95		
4 oz.		Agar, Nutrient, Standard, Difco	3.50		
1 qt.		Alcohol-Ethyl, Denatured (Synasol) (1 gal. available at $1.16)	.34		
1 lb.		Alum (aluminum potassium sulfate)	.59		
	1 sq ft.	Aluminum Sheet, #20 B & S, Cenco 89005-20	1.25		
1 lb.		Ammonium Hydroxide, Tech. (available in 1 gal. bottle at $1.50)	.56		
4 oz.		Beef Extract, Difco B126	4.20		
	4 oz	Benedict's Solution (available in 8 oz. bottle only at $1.70 - or can be purchased at drugstore)	.85		
1 lb.		Calcium Carbonate (marble chips), Tech.	.50		
1 lb.		Calcium Chloride, Tech., anhy. 8 mesh	1.09		
1 lb.		Calcium Oxide, Tech.	.70		
1 lb.		Carbon, powdered, Tech. (lampblack)	1.70		
1 lb.		Carbon Disulfide, purified	.95		
1 lb.		Carbon Tetrachloride, Tech.	.70		
1 lb.		Charcoal, wood, lumps	.50		
	1 sq ft.	Copper, Sheet, plain, #20 B & S, Cenco 89085-20	4.00		
[illegible] lb.		Copper Sulfate, Tech., small crystals (available 1 lb. at $.65)	2.50		

* Unit Cost as of January 1961.

Supplies for Seventh, Eighth and Ninth Grade Science

Recommended Amount [illegible]	Supplies (Chemicals) Description	Unit Cost*	On Hand Inventory	To be Ordered
[illegible]	Detergent, Alconox (3 lb. pkg.)	1.95		
[illegible]	Dextrose USP	.93		
[illegible]	[illegible] USP	1.37		
[illegible]	Ethyl Acetate, commercial grade (available in ½ gal. bottle at $2.95	1.38		
1 pt.	Fehling's Solution A	1.55		
1 pt.	Fehling's Solution B	1.80		
1 oz.	Gelatine, granulated, Tech.	.60		
1 lb.	Glycerine	1.20		
1 lb.	Formaldehyde, 40% N.F.	.50		
1 qt.	Hilex	.21		
1	Hydrion Papers with Type A and Type B rolls, Double dispenser, Welch	2.00		
1 pt.	Hydrogen Peroxide, 3% solution	.83		
1 oz.	Iodine, USP crystals	1.92		
1 pkg.	Iron Filings, degreased in sifter, Cenco 78395-2	.85		
1 sq.ft.	Iron Sheet, mild steel, #28 B & S, Cenco 39205-8	1.25		
1	Label Varnish, 8 oz., Cenco 11380-1	1.20		
1 sq.ft.	Lead Sheet, 1/32" thick, Cenco 39265-2	1.20		
1 lb.	Lime Water (calcium hydroxide solution)	.50		
1 btl.	Limewater Tablets (bottle of 100), Welch	.60		
10 vials	Litmus Paper, blue (available 12 vials at $1.00)	.12		
10 vials	Litmus Paper, neutral (available 12 vials at $1.00	.12		
10 vials	Litmus Paper, red (available 12 vials at $1.00)	.12		
1 oz.	Lycopodium Powder	1.00		

* Unit Cost as of January 1, 62

Recommended Minimum Quantity School Room	Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
1 oz.	Magnesium Ribbon	1.88		
1 lb.	Manganese Dioxide, Tech., powder	.70		
5 lb.	Mercury Metal, Tech. (available 5 lbs. at $34.00)	7.05		
4 oz.	Mercuric Oxide, red powder, purified	3.95		
1 lb.	Molasses	.21		
1 lb.	Paraffin (Parowax)	.25		
1 lb.	Petrolatum, yellow	.50		
8 oz.	Phenolphthalein, solution	1.70		
4 oz.	Phosphorous, red amorphous, powdered	2.24		
1 lb.	Potassium Chlorate, N.F.	1.26		
1 lb.	Potassium Iodide, U.S.P., crystals	4.61		
4 oz.	Potassium Permanganate, U.S.P. (available in 1 lb. bottle at $1.70)	.90		
1 oz.	Rennin Powder (available at grocery as "Junket", colored, at $.14)	1.30		
4 oz.	Silver Nitrate, C.P.	5.96		
1 qt.	Soap, green, liquid	.94		
1 lb.	Sodium Bicarbonate, U.S.P., powder (available 5 lbs. at $2.10)	.78		
5 lb.	Sodium Chloride, fine white, Tech.	1.00 [illegible]		
1 lb.	Sodium Hydroxide, U.S.P., pellets	1.01		
1 lb.	Sodium Nitrate, Tech., granular (available 5 lbs. at $1.35	.50		
1 lb.	Steel Wool, medium No. 1	.50		
1 lb.	Starch, Corn	.17		

* Unit Cost as of January 1961.

Recommended Minimum Quantity -- School	Room	Supplies (Chemicals) Description	* Unit Cost	On Hand Inventory	To Be Ordered
[illegible]	2 lb.	Sugar, Cane	.29		
[illegible]	1 lb.	Sulfur, Roll, lump	.50		
[illegible]	1 lb.	Sulfur, Flowers, powder	.50		
[illegible]	1 lb.	Zinc, Metal, mossy, Tech.	.85		
	sq ft.	Zinc Sheet, 1/32" thick, Cenco 89462	1.25		

* Unit Cost as of January 1961.

Recommended Minimum Quantity -- School	Room	Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered
	1	Aquarium Sealer, Wil-nes (tube of asphaltum-base liquid cement), Bd. of Ed., Educational Supplies	.30		
1 box		Candles, paraffin (12 to box), 7/8" x 4-3/4", Cenco 86505	.48		
	1 box	Cheesecloth (70 yds. to box), 36" wide, Cenco 12280-3	13.50		
	1 hank	Cord, Shade, common, #4, (48 ft. hank), Bd. of Ed., Educational Supplies, Code 266	.25		
1 pkg.		Cotton, absorbent, unsterile (1 lb. to pkg.), Cenco 12522	.95		
	6	Dry Cell , Eveready, No. 6, Bd. of Ed., Educational Supplies, Code 266	.67		
100		Electric Motor Kit ; S. W. Moore, Inc., 100 Beaver Street, Waltham, Mass.	.41		
50 lb.		Fertilizer, Vigoro, Danish Seed Co., Mpls.	3.00 /50 lb.		
	1 pkg.	Filter Paper, 12.5 cm (100 to pkg.), Cenco 13250	.48		
12 boxes		Fishfood, natural, Trans-Mississippi Biological Supply	.10		
1 cu. yard		Gravel, $\frac{1}{2}$" to 3/4", washed, Crown Sidewalk	4.25		
1 bottle		Insecticide, Black Leaf-40, 2 oz., Danish Seed Co.	.98		
	1 box	Labels, 64 x 40 mm, #201 (box of 25), Cenco 16985	.16		
	1 box	Lamps, Incandescent, miniature, tungsten filament, 2.5 volts (10 to box), Cenco 84420-1	2.50		
	1 pr.	Magnet, Bar, breaking, 70 x 8 x 4 mm, Cenco 78315	1.00		
	1 pkg.	Needles, #6 Sharps Sewing (20 in pkg.), Bd. of Ed., Educational Supplies	.055		

* Unit Cost as of January 1961.

ecommended Amount bility —		Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered
chool	Room				
	2 cans	Paint, enamel, aluminum, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, empire green, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, flat black, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, ultra white, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	2 cans	Paint, enamel, vermillion, spray, Japalac (16 oz. cans, instant spray in pressurized cans), Bd. of Ed., Educational Supplies	.93		
	1	Paper, tablets, tracing, 9" x 12", Bd. of Ed., Educational Supplies	.20		
	1 pkg.	Paper, blueprint, 8" x 10" (24 sheets in pkg.), 7884S2H, Bd. of Ed., Educational Supplies	1.30		
4 bu.		Prepared Potting Soil, sterilized, Bachman's Nursery	3.50 /bu.	-	
50 lb.		Purina Laboratory Chow, Purina Mills, Mpls.	4.85 /50 lb.		
	2 pkg.	Razor Blades, single edge (10 in dispenser), Gem, Bd. of Ed., Educational Supplies	.41		
	1 pkg.	Rubber Balloons (12 to pkg.), Cenco 13040	.32		
	1 pkg.	Rubber Dam, 12" sq., Cenco 13095-1	.50		
5 packs		Rags, washed, request through chief engineer	NC		
	10	Sandpaper, #2/0, finishing, 100 grit, Bd. of Ed., Educational Supplies	.027		
	10	Sandpaper, #6/0, finishing, 220 grit, Bd. of Ed., Educational Supplies	.027		
	[illegible]	Sandpaper, #00, cabinet, 120 grit, Bd. of Ed., Educational Supplies	.044		

* Unit Cost as of January 19[illegible]

Equipment and Supplies for Seventh, Eighth and Ninth Grade Science

Recommended Minimum Quantity -- School	Room	Supplies (Consumable) Description	# Unit Cost	On Hand Inventory	To Be Ordered
	1 pkg.	Silicone Lens Paper (200 sheets per pkg.), 3" x 6", Welch 8351C	.39		
	6 oz.	Silk Pins	.65 /6 oz.		
	1 lb.	Solder, wire, #10, 50-50, Bd. of Ed., Educational Supplies	.73		
	1	Soldering Paste, 2 oz. can, Bd. of Ed., Educational Supplies	.18		
	2 spls.	Thread, No. 10 black (250 yds.), Sears Roebuck	.29		
	2 spls.	Thread, No. 10 white (250 yds.), Sears Roebuck	.29		
12 boxes		Turtle Food, Trans-Mississippi Biological Supply	.15		
25 lbs.		Vermiculite (in 5 lb. bags), Bd. of Ed., Education Supplies, Code 221	.17 /5 lb.		
	1 lb.	Wire, copper, annunciator wire, #18 B &S, Cenco 89540-18	2.10		
100 ft.		Wire, Extension Cord, copper, rubber covered, No. 18, Bd. of Ed., Maintenance Supplies	.042 /ft.		
	1 pkg.	Wood Splints (500 to pkg.), Cenco 12670	.6		

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5-17-63

* Unit Cost as of January 1961

Recommended Minimum Quantity -- School	Room	Supplies (Consumable) Description	* Unit Cost	On Hand Inventory	To Be Ordered	
	1 pkg.	Silicone Lens Paper (200 sheets per pkg.), 3" x 6", Welch 83510	.39			
	6 oz.	Silk Pins	.65 /6 oz.			
	1 lb.	Solder, wire, #10, 50-50, Bd. of Ed., Educational Supplies	.73			
	1	Soldering Paste, 2 oz. can, Bd. of Ed., Educational Supplies	.18			
	2 spls.	Thread, No. 10 black (250 yds.), Sears Roebuck	.29			
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recopied by jew
5-17-63
* Unit Cost as of January 1961

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

MEMORANDUM

To: All General Science Teachers

From: Albin Olszewski, Sheridan

Subject: Evaluation of the following three sets of rocks: the Teacher's Demonstration Set (3"), the Student's Collection Set (2") and the Bag of 36 unknown minerals (1) for student laboratory practice.

The committee on improving laboratory demonstrations in the Geology Unit, recommended that a standardized set of minerals for the teacher's demonstration be 3 inches in size. The student collection set be 2 inches in size and the bag of 36 unknown minerals for Student laboratory practice be 1 inch or 1½ inch.

Minerals in the teacher's set (3") consist of the following: Hematite, Kaolinite, Limonite, Magnetite, Quartz, Siderite, Taconite, Apatite, Asbestos, Azurite, Bauxite, Calcite, Carnotite, Chalcopyrite, Onyx, Corrundum, Diamond, Flourite, Garnet in Schist, Graphite, Gypsum, Halite (rock salt), Manganese, Marble, Mica (Biotite), Native copper, Obsidion. Oolite, Orthoclase, Pyrite, Pyrrhotite, Schoelite, Shale (Sylvite), Sphalerite, Sulfur, Talc, Topaz, Tourmaline, Willemite, Basalt, Conglomerate, Dolomite, Gneiss, Granite, Limestone, Peat, Sandstone, Schist, Shale, Slate, Marble, Quartzite, Soapstone. (53)

The student's collection (2") are as follows: Hematite, Kaolinite, Limonite, Magnetite, Quartz, Asbestos, Bauxite, Carnotite, Calcopyrite, Fluorite, Galena, Graphite, Halite, Mica (Biotite, Native copper, Pyrite, Quartz (Jasper) (17)

The bag of 36 unknown minerals for student laboratory practice are to be identified.

Evaluati[illegible] of the 3 inch teacher demonstration set - $60.00

1. A standardized set of minerals is necessary to follow the laboratory exercises and demonstrations.

2. The teacher's demonstration set be 3 inches in size to facilitate better identification and viewing for the student.

3. A 3 inch size sample will discourage pilferage.

4. Better quality of ore samples are found in large pieces.

5. Demonstrations are more dramatized and meaningful.

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Science Department

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Memorandum: All General Science Teachers - evaluation of 3 sets of rocks

Evaluation of the 2 inch size for student collection set - $8.00

1. The 2 inch size is large enough to make a close comparison.
2. Cheaper to replace if lost.
3. Will have more usage than the larger size.

Evaluation on the bag of 36 unknown minerals for student laboratory practice - $2.90

1. These are the cheaper in price.
2. Expendable eventually because of the usage in various tests.
3. Will help develop an interest in rock identification.
4. Will make geology more interesting by using the laboratory and its samples.

AO:gm
2-7-63

MINNEAPOLIS PUBLIC SCHOOLS
Science Department

SUPPLIERS OF SCIENCE EQUIPMENT AND MATERIALS AND THEIR REPRESENTATIVES

Aloe, Division of Brunswick Corp.
3501 Raleigh Avenue
Minneapolis, Minnesota 55416
927-7351
Rep. A.C. Rink

American Optical Company
2616 Nicollet Avenue
Minneapolis, Minnesota 55408
823-8261
Rep. Bob Anderson

Bausch & Lomb Optical Co.
27 North 4th Street
Minneapolis, Minnesota 55401
335-5195
Rep. George Winikates
335-8788

Becton, Dickinson & Co.
Rutherford, New Jersey
Rep. Herbert S. O'Connor
Lakeview Terrace
Waconia, Minnesota 55387

Bower and Haack Microscope Service
Benjamin Haack, Manager
1826 Como S. E.
Minneapolis, Minnesota 55414
331-5791

Braun Mfg. Co.
Midget Incubators
Box 274
Chatham, New Jersey 07928

Carolina Biological Supply Co.
Burlington, North Carolina 27216
No local representative

Central Scientific Company (Cenco)
Bob Bieser, V. Pres.
1700 Irving Park Road
Chicago, Illinois 60613
Rep. Ed Lang

Chicago Scientific Corp.
Laboratory Apparatus and Chemicals
7319 Vincennes Avenue
Chicago Illinois 60607
Attn.: E.C. Lieber

Corning Glass Works
Laboratory Products Inc.
Corning, New York 14830
Rep. Timothy V. Hartnett
514 Grand Avenue
St. Paul, Minnesota 55102
227-2369

Creative Educational Society
Box 589
Mankato, Minnesota 56001
Rep. Fred E. Wheeler
3609 Aldrich Avenue So.
Minneapolis, Minnesota 55409
822-5664

Denoyer-Geppert Company
5235 Ravenswood Avenue
Chicago, Illinois 60640
Rep. T. H. Kjorlaug
201 Milbert Road
Minneapolis, Minnesota 55426
545-5990

Doerr Glass Company
Vineland, New Jersey 08360
Rep. Richard Wheeler
2086 Iglehart Avenue
St. Paul, Minnesota 55105
645-8746

Eckert Mineral Research, Inc.
110 East Main Street
Florence, Colorado 81226
No local representative

Edison Scott Squire Co., Inc.
New Richmond, Wisconsin 54017
No local representative

Elgeet Optical Company, Inc.
303 Child Street
Rochester, New York 14611
No local representative

Farmer Seed and Nursery Co.
4631 Excelsior Blvd.
Minneapolis, Minnesota 55416
920-1733

Faust Scientific Supply Company
5108 Gordon Avenue
(Biology material only)
Madison, Wisconsin 53716

Foam Plastics, Inc.
17 Southwest Third Street
Osseo, Minnesota 55369
425-4224

General Biological Supply (Turtox)
8200 South Hoyne Avenue
Chicago, Illinois 60620
No local representative

General Science Service Company
Rep. Chester Newby
3450 Yosemite Avenue
P.O. Box 8423
Minneapolis, Minnesota 55426
929-2385

The Industrial & Scientific Instrument Co.
5225 Germantown Avenue
Philadelphia, Pennsylvania 19144
No local representative

Arthur S. LaPine & Co.
6001 South Knox Avenue
Chicago, Illinois 60629

Macalester Scientific Corp.
Joseph Hart
253 Norfolk Street
Cambridge, Massachusetts 02139
No local representative
(New Sales & Services Facilities)
Rep. Thomas F. Shea
215 Burlington Street
Western Springs, Illinois 60558
(312) 246-6070

A.J. Nystrom Company
3333 Elston Avenue
Chicago, Illinois 60618
Rep. Ed Hurley
5209 Mirror Lake Drive
929-4958

Physicians & Hospitals Supply Co.
1400 Harmon Place
Minneapolis, Minnesota 55403
333-5251
Rep. Merlin F. Peterson

Pioneer Plastics, Inc.
8321 Atlantic Blvd.
Jacksonville, Florida 32211

E.H. Sargent & Company
4647 West Foster Avenue
Chicago, Illinois 60630
(312) 777-2700
Rep. Merle T. Nelson
5746 Harriet Avenue
Minneapolis, Minnesota 55419
(612) 823-3301

Schaak Electronics Inc.
3867 Minnehaha Avenue So.
Minneapolis, Minnesota 55406
729-8382

Science Associates
P.O. Box 216
194 Nassau Street
Princeton, New Jersey 08540
No local representative

Science Electronics, Inc. (Linco)
195 Massachusetts Avenue
Cambridge, Massachusetts 02139
(Formerly Lincoln Apparatus, LINCO)
(for PSSC physics)
Rep. Terrence McGann (SIGNAL SYSTEMS)
340 East Franklin Avenue
Minneapolis, Minnesota 55404
339-9195

Scientific Products
3846 Washington Avenue North
Minneapolis, Minnesota 55412
529-7735
(Division of American Hospital Supply Corp.)
Rep. Roy Sternard
788-3371
City Desk - Richard Marty

Stansi Scientific Company
1231 North Honore Street
Chicago, Illinois 60622
No local representative

E. G. Steinhilber & Co., Inc.
102 Josslyn Street
Oshkosh, Wisconsin 54901
No local representative

Trans-Mississippi Biological Supply
892 West County Road B
St. Paul, Minnesota 55113
489-5259
Rep. B.L. Hawkins
(afternoons -
646-4843, Station 254)

Viking Safety & Supply Division
2474 Territorial Road (Safety glasses)
St. Paul, Minnesota 55114
646-3744

George T. Walker & Co.
2218 University Avenue S.E.
Minneapolis, Minnesota 55415
333-3343 - City Desk (Ed Sears or Gordon Danielson)
Rep. Charles L. Howe
6104 11th Avenue South
Minneapolis, Minnesota 55417
869-2348

Ward's Natural Science Establishment, Inc..
P.O. Box 1712
Rochester, New York 14603
No local representative

W. M. Welch Scientific Company
7300 N. Linder Avenue
Skokie, Illinois 60076
Rep. Chester L. Nightengale
Box 473
Alexandria, Minnesota 56308

Wilkens-Anderson Company
4525 W. Division Street
Chicago, Illinois 60651
Rep. James Ramseth
4525 W. Division Street
Chicago, Illinois 60651

Wright's Mineral Service Inc.
3207 Cedar Avenue
Minneapolis, Minnesota
722-9677 (Anderson's)
Rep. Erdis Wright
9612 Chicago Avenue South
Minneapolis, Minnesota 55420
881-0032

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